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Capacity Building of Local/National NGOs/CBOs in Africa (Cap-WASH)

**Meeting The Water And Sanitation MDGs Final
Report
Tanzania**

Funding for this publication was provided by the people of the United States of America through the U.S. Agency for International Development (USAID), as a component of the NAME OF PROGRAM. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Agency for International Development of the United States Government or Florida International University.

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For bibliographic purposes, this document should be cited as:

Meeting The Water And Sanitation MDGs: A Study Of Human Resource Requirements In Tanzania Final Report, Tanzania. 2012. Global Water for Sustainability Program, Florida International University.

ISBN:

Front cover: an improved water source – borewell in a village; headwater stream in a forested catchment in the Eastern Arc Mountains

Rear cover: clouds condensing on higher slopes of the Eastern Arc Mountains that are the water towers of Tanzania.

List of Abbreviations

| | |
|------------|--|
| ARU: | Ardhi University |
| CBO: | Community Based Organization |
| CSOs: | Civil Society Organizations |
| COWSOs: | Community Owned Water Supply Organizations |
| CoET: | College of Engineering and Technology |
| DIT: | Dar es Salaam Institute of Science and Technology |
| EWURA: | Energy and Water Utilities Regulatory Authority |
| ERB | Engineers Registration Board |
| HR: | Human Resource |
| LGAs: | Local Government Authorities |
| LNGOs: | Local Non-Governmental Organizations |
| MDG: | Millennium Development Goals |
| MIST: | Mbeya Institute of Science and Technology |
| MoWI: | Ministry of Water and Irrigation |
| MKUKUTA: | Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania |
| NACTE: | National Council for Technical Education |
| NGOs: | Non-Governmental Organization |
| NSGRP: | National Strategy for Growth and Reduction of Poverty |
| O&M: | Operation and Maintenance |
| PORALG: | President's Office for Regional and Local Government |
| RTSCs: | Regional Vocational Training and Services Centres |
| SUA: | Sokoine University of Agriculture |
| TAWASANET: | Tanzania Water Supply and Sanitation Network |
| UNESCO: | United Nations Educational, Scientific and Cultural Organization |
| UNICEF: | United Nations Children's Fund |
| VETA: | Vocational Education and Training Authority |
| VTC: | Vocational Training Centre |
| VITC: | Vocational Instructors Training College |
| WATSAN: | Water and Sanitation |
| WHO: | World Health Organization |
| WSSAs: | Water Supply and Sanitation Authorities |
| WSDP: | Water Sector Development Programme |

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EXECUTIVE SUMMARY

BACKGROUND

In 2006, the World Health Organization's World Health Report estimated that 4.3 million additional health workers would be needed worldwide to achieve the health related Millennium Development Goals. Subsequently in 2008, UNESCO estimated that 18 million new teachers would be needed to meet the Millennium Development Goal (MDG) of achieving universal primary education. In the water and sanitation sector, the human resource requirement to meet the MDG targets is relatively unknown and therefore there is a need to assess the constraints to meet the MDGs and to sustain services in relation to the numbers of staff, qualifications and their practical experience. In 2005, a study was conducted in Tanzania to assess the Human Capacity Needs for Water Resources Management and Development. However, the study did not focus on assessing the human capacity need to meet the MDGs. In response to this deficiency, another study was undertaken to develop a methodology which was piloted in five countries in Africa. The results of this are published in a Human Resource (HR) Capacity: Mind the Gaps Project Phase 1 synthesis report.

The current institutional framework for the provision of water supply and sanitation services in Tanzania is based on a separation between urban water supply and sewerage services, and rural water supply and sanitation services. It is rather complex to implement, both in law and in practice. It has a number of overlapping responsibilities, duplications and omissions. Furthermore, the mechanisms for effective consultation and consensus building, and participation of stakeholders in the decision-making process are not adequately defined and hence a challenge to implement.

OBJECTIVE OF STUDY

The main objective of this study was to assess human resource requirements in the Water and Sanitation Health sector (WASH) sector to achieve the water and sanitation MDGs services in Tanzania. In addition, the methodology adopted in this Phase II study also estimated the HR requirements to achieve full coverage of water supply and sanitation for the predicted population in 2015. The study focused on the human resource requirements from the public sector and parastatal institutions, and the private sector (private consultancy companies, individual contractors, etc), as well as NGOs, Community Based Organizations active in the WASH sector.

METHODOLOGY

The methodology was designed to calculate both current and expected additional human resource requirements based on an assessment of existing service coverage and future targets, the existing availability of WASH professionals and their future supply to the market. The methodology in Phase II is based upon the methodological framework developed in Phase I, but with a number of adaptations and clarifications.

For example, the methodology in Phase II aimed to make a clearer distinction between HR requirements for:

- a) Design and construction of new infrastructure
- b) Operation and maintenance
- c) Community mobilisation, sanitation and hygiene promotion.

The HR requirement to meet the MDGs in Tanzania was assessed based on three sectors, namely NGOs, private and public sectors. Thus, sampling was done targeting the three sectors of which the list is given section 1.2.4 of this report. A scientific approach was used to estimate the number of sample organizations. The data collection method used in the study was administration of questionnaires which was prepared and sent out to the sampled organisations. Seven study elements shown in this report were undertaken during the study. These elements are: (i) estimating country's population in 2015 (ii) calculating WATSAN coverage (iii) estimating HR demand (iv) examine existing HR capacities (v) assess HR supply (vi) calculating HR shortages and assessing the gaps and (vii) estimating the additional HR requirements to meet MDGs and full service coverage in WatSan.

It was important to make a distinction between the water supply and sanitation sectors. In this study we assumed that for water supply, the times used for design and construction is only 10% while the time for operation and maintenance is 85% and the time spent for promotional activities is 5%. For sanitation sector the study assumed that 20% of the time is used for construction, 5% of time for Operation and Maintenance (O&M) and 75% for promotion

MAIN FINDINGS

The HR Demand for all Categories and Settings

For water supply, the HR demand for WatSan is the highest, estimated at 7,573. More of the HR is demanded in the rural areas where majority of Tanzania population is living. The lowest HR demand is for social development estimated at 320 of which is less demanded in the urban areas. The low shortage for WatSan technical field personnel in sanitation sector could be attributed by the fact that as far as sanitation is concerned in Tanzania, behaviour change is more important than putting the facilities in place. This is also evidenced by high shortage of social development in sanitation sector. The high shortage of HR of all sorts of jobs in rural settings both for water supply and sanitation sector could be due to the fact that many HR would prefer to work in urban areas rather than rural areas. Reasons provided for this preference was that many, especially young and fresh engineers find rural areas to be socially backward and lacking services.

HR shortages for Water and Sanitation Sectors

The average number of WatSan technical field personnel that will be required to achieve MDGs in water supply by 2015 is estimated at 3,864 compared to sanitation sector that will need 637 personnel in Watsan technical field. However, the HR required for social development in the sanitation sector is 2,670 compared to water supply which is estimated at 669. Thus, this highlights the fact that, as far as the sanitation sector is concerned, there is need for more software (sensitization, awareness etc) than hardware compared to water supply where more hardware is required than software. The high shortage for those within the watsan discipline in water sector could be attributed to the fact that more water infrastructures are still needed to be constructed to meet the MDGs. On the other hand social development workers are more needed in sanitation sector than in water sector probably due to the need of changing the people's behaviour.

The sector as a whole, indicated to be specifically short of environmental engineers, programme officers and technical officers within the broader Watsan technical field category. In the social development category, they seemed to be lacking numerous sanitation marketing/ community empowerment offices. The reasons for these kinds of gaps for social development category could be due to the fact that these skills are

not taught in the formal system of our higher education institutions which is largely probably due to curricula in our education systems not addressing these skills and knowledge. The gap on environmental engineers could be due to either environmental engineers are not interested to work in water sector or the water sector doesn't employ them effectively

HR Shortages in different work areas (construction, O&M and community mobilisation)

HR shortages in Tanzania for water supply are highest for O&M (7,589) and lowest for mobilisation (447). This can be probably attributed to the need of more maintenance of the infrastructure for the sustainability of the services. However, on the other hand, the sanitation sector has the highest shortage on mobilisation and lowest for O&M. It can be explained that the highest shortage for mobilisation calls for more software component in sanitation than the hardware part. The high shortage for O&M in water supply sector could be attributed to the fact that in the classical/traditional delivery of WASH course, not much emphasis is given to O&M. On the other hand the high shortage for social development workers for sanitation sector is attributed to not having many people in this discipline who would like to work in sanitation sector because of lack of incentives in the sector, or sanitation is not competitive economically with other sectors.

Rural vs. urban HR capacity shortages

For water supply sector, the highest HR shortage to meet the MDG's is in WatSan specific technical fields estimated at 3,864 of which is mainly observed in rural settings. The lowest shortage is on Engineers estimated to be 119 in urban settings. In the rural areas, there is a shortage of 7,142 Human resources to meet the MDGs, while in urban areas a shortage of 1,786. This explains the need to have more Water and sanitation Engineers for installation of the various facilities. This is because water supply and sanitation coverage is more in urban areas than in rural areas and there are also more water supply options in urban setting than in rural settings. Moreover, more HR would like to be based in urban areas so there seems to be more HR available.

HR Shortages in different types of organisations (NGO, Private, Public)

In order to achieve the MDGs for WatSan in Tanzania for water supply, more WatSan (2,705 HR) are required in public sector than in NGOs and Public Sector. This can be explained by the fact that the public sector is more interested in building (putting up) the water facilities in place and there the public sector seems to employ technical WatSan professionals. Less of these technical fields for water supply will be required in the NGOs (425 HR). However for Sanitation Sector, more WatSan technical field and Social Development workers will be required in NGOs than in private and public sectors. For the same sector (sanitation) the HR shortage for NGOs is 319 HR (WatSan technical field) and 1,602 HR for social development. The corresponding figures for private and public sectors are 1068 HR, and 0 HR respectively. The results show the importance of NGOs in sanitation sector but also the need to focus on software component for the sanitation sector. For sanitation sector it still appears that the public sector doesn't need more social development as public sector focus is on infrastructure.

The general observations confirm the results of the interviews presented above which shows that there is great demand of WatSan staff in the public sector which could be attributed to the massive investment by the state to the water sector. A lot of HR in particular WatSan technical field is needed to run the newly designed rehabilitated and constructed water supply projects. This goes in line with the

subsequent requirements of commercial and financial staff to assist in commercially running the utilities.

On the other side it was quite evident during field data collection that very little is being done in investing in sanitation and hence very low demand in all carders of sanitation HR. However low investment drive in sanitation has only one meaning that the sanitation situation is worsening and this is reflected in numerous programs run by NGOs advocating alternative affordable sanitation technology and hygiene promotion and hence a higher number of HR related to NGOs doing hygiene promotion through social mobilization

Assessment of Gaps for Different Categories

Besides looking at shortages (numbers), this study was also meant to evaluate the gaps (for different categories of the jobs indentified in the study). This sort of information is crucial to understand whether it is numbers that the country is lacking in terms of job categories described to meet the MDGs, or skills and competencies. The following section briefly explains the type of gap that was identified in this study;

Technical fields: Under this discipline, the study found that there was a particular lack of Project design, planning and, Analytical skills, as well as a lack of knowledge regarding Integrated Water Resources Management (IWRM). Additionally, for the same type of job, Monitoring and Evaluation, Operation of some facilities, Writing skills and design particularly use of software and Communication skills were identified to be the gaps. Within the Social Development HR category, the study indicated that more Advocacy, Lobbying and Governance skills were needed. There are also few trained socio workers trained at University levels dealing with sanitation and Community mobilization skills.

No specific skills were identified and reported as a gap in the course of study survey under the Management and Finance job category.

RECOMMENDATIONS

The study is recommending two main measures to increase the HR supply in WatSan so as to meet the MDGs in 2015. The two measures are:

i) Increase the supply of trained staff in all sectors. Under this measure the following is suggested for implementation

- Increase support for training institutions offering relevant courses in WatSan.
- More work experience (hands-on training) opportunities for students
- Focus on skills required for asset management and O&M Short-term courses
- Vocational training courses
- Ensure professionals have a broad skills base
- Specific focus on capacity development in small towns and rural areas
- Incentives for development
- Addressing the gender imbalance

ii) The second measure is Institutional support for human resource development. Under this measure there is need for increased clarity between national level agencies about their institutional roles, but also the need for a single agency with a clear mandate to co-ordinate human resource development within the sector. In support of this, more work is needed to better understand the relationship between the number of organizations working in the national WASH sector, the levels of

capacity available and how this aligns with national HR priorities, policies and strategies.

STUDY OBSERVATIONS

The study found that reliable estimates of people working in the sector, from the developed methodological framework, are difficult to obtain due to the fact that available information is often incomplete and or unavailable. The methodological framework proposed is data intensive. The lack of data has implications in assessing existing and estimating future skills shortages. Nonetheless, notwithstanding the inaccuracies of the data, the case study has shown that the supply of qualified staff entering the workforce is insufficient for various reasons as highlighted in section 5.2.1 of this report.

1. INTRODUCTION

1.1 Background

In 2006, the WHO World Health Report estimated that 4.3 million additional health workers would be needed worldwide to achieve the health related Millennium Development Goals. Subsequently in 2008, UNESCO estimated that 18 million new teachers would be needed to meet the MDG of achieving universal primary education. In the water and sanitation sector, the human resource requirement to meet the MDG targets is relatively unknown and therefore there is a need to assess the constraints to meet the MDGs and to sustain services in relation to the numbers of staff, qualifications and their practical experience. Though there was another study conducted in Tanzania to assess the Human Capacity Needs for Water Resources Management and Development, the study didn't focus to meet the MDGs. In response to this, a previous study was undertaken to develop a methodology which was piloted in five countries. The results of this are published in a Human Resource (HR) Capacity: Mind the Gaps Project Phase 1 synthesis report.

1.2 Objective of Study

The main objective of this study was to assess human resource requirements in the WASH sector to achieve the MDGs targets relevant to water and sanitation services in Tanzania. In addition, the methodology applied in this study also estimated the HR requirements to achieve full coverage of water supply and sanitation for the predicted population at 2015. The study focuses on the human resource requirements from the public sector and parastatal institutions, and the private sector (private consultancy companies, individual contractors, etc), as well as NGOs active in the sector.

In order to achieve the main objective of this study, the following sub-objectives were developed:

- Estimate the 2015 population in Tanzania while factoring population growth
- Determine the current WatSan coverage and calculate the expansion needed to achieve a) MDGs and b) full service coverage
- Estimate a proxy of HR demand per type of service delivery for 10000 people
- Determine the existing HR capacity in the country in terms of numbers and skill
- Assess the HR supply in the years up to 2015 in terms of graduates as well as on the job training.
- Calculate the HR shortages and assess the HR gaps
- Determine the way HR development institutions can address the shortages and gaps, as well as provide recommendations for alternative ways to meet the shortages and gaps.

1.3 Methodology

1.3.1 Study location map



Figure 1.1 Study Location Map

1.3.2 Overview of the Methodology

The methodology used in this study was designed to calculate both current and future additional human resource requirements, based upon an assessment of

existing service coverage, MDG targets, and existing availability and future supply of professionals. The methodology used in this Phase II of assessment is based on the methodological framework developed during Phase I of a similar assessment, but with a number of adaptations and additions.

For instance, the methodology in Phase II aimed to make a clear distinction between HR requirements for:

- a) Design and construction of new infrastructure
- b) Operation and maintenance
- c) Community mobilisation, sanitation and hygiene promotion.

The assessment study had a broader view, including defining shortages related to the composition of the HR workforce and their respective skills and training, in quantitative terms, and examining the gaps where people lack the necessary skills to perform their respective jobs effectively. It therefore aimed to collect qualitative information to examine broader organisational aspects that influence the WatSan sector's attractiveness, such as salaries, benefits and job security.

The study aimed to determine the HR shortages and gaps, and within this framework the following definitions were used:

- *Demand* - the estimated number of staff of different levels of skill and qualification that are required for delivery of water supply and sanitation services on top of the existing.
- *Capacity* – The number of staff available to deliver water supply and sanitation services
- *Supply* - the number of new trained staff with relevant qualifications emerging from universities or other training institutions.
- *Shortages* - where future HR demand exceeds the sum of existing and future supply of HR.
- *Gaps*- when people lack the necessary skills to perform their job in an effective manner.

This study will use the following disciplines to map the different WASH human resources:

1.3.3 Samplin

The HR requirement to meet the WatSan MDGs in Tanzania was assessed based on three sectors, namely NGOs, private and public sectors. The sampling procedure for each sector and the list of all organisations contacted during this study is explained the following sections.

1.3.3.1 Sampling NGOs involved in WASH

1. NGOs in the WASH sector were identified through Tanzania Water Supply and Sanitation Network (TAWASANET) where it was established that there are 40 member NGOs dealing with the WatSan and 15 CBOs dealing with hygiene promotion.
2. Random sampling was done but NGOs representing both rural and urban setting. A total of 13 NGOs representing about 33% of all NGOs were sampled and contacted during the study, the list of which is given in the table below. It is useful to note that, it was the recommendation of the client that the number of NGO's to be contacted was not to exceed 15.

Table 1.1: NGOs contacted during the study

| S/N | Name of NGO | Location | Setting of Work |
|-----|--|------------------|-----------------|
| 1 | Tumaini Environmental Conservation Group (T.E.C.G) | Tanga | Rural and Urban |
| 2 | Siafu and Upendo Women Development Organization (SUWODE) | Dar es Salaam | Rural and Urban |
| 3 | Shinyanga Foundation Fund (SFF) | Shinyanga | Rural and Urban |
| 4 | Water and Environmental Sanitation Projects Maintenance Organization (WEPMO) | Dar es Salaam | Rural and Urban |
| 5 | TUSHIRIKI | Mbeya | Rural |
| | Ileje Environmental Conservation Association (IECA) | Ileje, Mbeya | Rural |
| 6 | MAJI NA MAENDELEO DODOMA (MAMADO) | Dodoma | Rural |
| 7 | BADILIKA | Musoma | Rural |
| 8 | DARAJA | Njombe | Rural |
| 9 | MSABI | Ifakara-Morogoro | Rural |
| 10 | Care Tanzania | Dar es Salaam | Rural and Urban |
| 11 | UCHIRA | Moshi | Rural and Urban |
| 12 | WaterAid Tanzania | Dar es Salaam | Rural and Urban |
| 13 | World Vision | Dar es Salaam | Rural and Urban |

The above shows that, based on the location of the contacted NGOs (see map in Figure 1.1), the study managed to have a good sample representing wide geographical coverage and different work settings (both on rural and urban areas).

1.3.3.2 Sampling Private Sector Organisations involved in WASH

This study ensured that the different types of organisations that fall within the private sector were well represented.

Private sector organisations in the WASH sector (include contractors, consultants, service providers) were identified and their number estimated. The various registration boards for both contractors and consultants were contacted in order to verify, and also obtain more information on other organizations that were not previously identified or listed. Through guidance from the various registration bodies, a detailed list of companies working solely on WASH was drawn of which a sampling list was established. Experience of researchers and consultants in the various organizations was used as criteria to draw up a sample list of specialised service providers in the private sector for engaging in the study. The sample of private organizations comprised of (i) 3 Consultants, (ii) 3 Contractors and (iii) 2 Service providers. The sample list is shown in the Table 1.2.

Table 1.2: Private organizations sampled and contacted during this study

| S/N | Name of Institution | Location | Setting of Work |
|-------------------------|---|---------------|---------------------|
| Consultants | | | |
| 1 | Poyry Tanzania Ltd | Dar es Salaam | Urban |
| 2 | DON Consult Ltd | Dar es Salaam | Urban |
| 3 | Tanzania Association of Environmental Engineers | Dar es Salaam | Urban |
| Contractors | | | |
| 1 | Jandu Plumbers Ltd | Arusha | Rural & urban |
| 2 | Water Solutions | Arusha | Rural & urban Rural |
| 3 | DABENCO Ltd | Dar es Salaam | Rural & urban |
| Service Provides | | | |
| 1 | Davis & shirtliff | Dar es Salaam | Urban& Rural |
| 2 | Merry Water | Dar es Salaam | Urban |

1.3.3.3 Sampling for Public Sector Organisations

The sampling for Public Sector included the national line agency(ies) responsible for the water, sanitation and hygiene sector in the country. The public organizations sampled were at the national level and Local Government Authorities (LGAs). The list of sampled and contacted public organisations is given in Table 1.3.

Table 1.3: Public sector organisation contacted during this Study

| S/N | Name of Institution | Location | Setting of Work |
|--|---|-----------------|-----------------|
| GOVERNMENT MINISTRIES | | | |
| Ministry of Water | | | |
| 1 | Department of Rural Water Supply | Dar es Salaam | Rural |
| 2 | Department of Urban Water Supply and Sewerage Authority | Dar es Salaam | Urban |
| | Water Laboratory Unit | | |
| WATER SUPPLY AND SANITATION AUTHORITY | | | |
| 3 | Babati | Babati | Urban |
| 4 | Bukoba | Bukoba | Urban |
| 5 | Kigoma | Kigoma | Urban |
| 6 | Lindi | Lindi | Urban |
| 7 | Sumbawanga | Sumbawanga | Urban |
| 8 | Kiliwater-Rombo | Kiliwater-Rombo | Rural |
| DISTRICT COUNCILS | | | |
| 9 | Bunda District Council | Bunda | Rural |
| 10 | Nachingwea District Council | Nachingwea | Rural |

1.3.4 Data collection (secondary resources and semi-structured interview/survey)

The main method of primary data collection was using structured questions in a questionnaire of which was prepared and sent or administered to the sampled organisations in all sectors (NGOs, private and public sectors). The questionnaire that was used in this study is shown Annex 1. Two workshops were also conducted, one during the inception phase which aimed at awareness creation, presentation of the methodology and also getting some basic information and sources from the key stakeholders (Plate 1) and the second one was during the validation phase which aimed at validation of the findings/results.



Plate 1: Presentations and discussions during inception workshop in Dar es Salaam

1.3.5 Analysis of the data

The following 7 study elements shown in Figure 1.2 below were undertaken during the study. Since some of the elements could be carried out simultaneously, this study aimed to undertake the 7 elements in 5 main steps as shown in the methodological framework indicated in Figure 1.2.

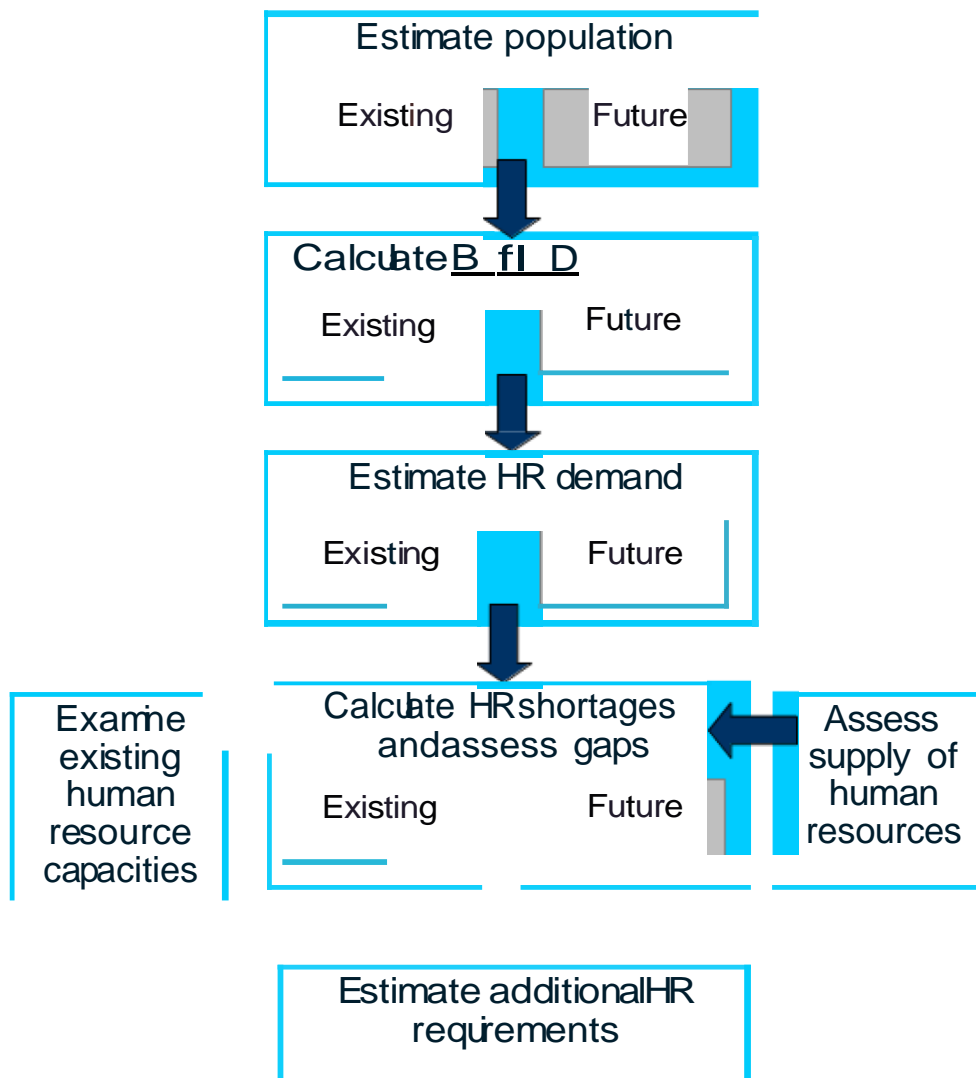


Figure 1.2 Methodological U itWQrls

The seven elements are summarized in Table 1.4, of which highlights the rational, activities and the methodological approach for each element.

Table 1.4: Methodological framework

| Study Element | Rationale | Activities | Methodological approach |
|--|--|--|--|
| 1. Calculate existing and future populations | Population data is fundamental for calculating the existing Watsan coverage and the future Watsan demand. A characterization of the types and number of settlements (i.e. city, large town, small town, rural village and dispersed communities) is required to define types of service delivery and HR requirements in urban and rural areas. | <ol style="list-style-type: none"> 1) Obtain 2010 population data and growth rates. 2) Identify centres of human population (i.e. towns and cities) to be able to estimate the number of settlements). 3) Estimate population and its distribution in settlements in 2015 | <ul style="list-style-type: none"> • Secondary sources (Population Census, National demographic databases) • Excel sheet 4.2.1 • Case study narrative |
| 2. Calculate Watsan coverage | An analysis of the existing coverage according to JMP data combined with an estimate of future service requirements (using population data as described above) is needed to estimate the MDG and full coverage deficit. | <ol style="list-style-type: none"> 1) Obtain data about existing watsan coverage (JMP). 2) Identification of types of water service provision in different types of settlements. 3) Identification of types of sanitation service provision in different types of settlements. 4) Estimate future Watsan service needed to achieve a) MDGs and b) full coverage. | <ul style="list-style-type: none"> • JMP data (existing coverage and MDG targets) • Telephone consultation/interview • Excel sheets 4.2.1 and 4.2.2 • Case study narrative |
| 3. Estimating existing and future HR demand | On the basis of the existing watsan coverage types, establish a proxy of HR (according to the defined categories of service delivery in urban and rural areas) required to a) design construct/implement and b) operate and maintain services for 10000 people per year. This proxy in combination with the future watsan coverage needed will determine the HR demand for future watsan (both MDG/full coverage). | <ol style="list-style-type: none"> 1) Estimate HR per watsan type to design / construct / implement for 10 000 people. 2) Estimate HR per watsan type to operate and maintain system for 10 000 people. 3) Use these estimations and future watsan coverage (4.2.2) needed to calculate proxy for future HR demand in order to achieve MDGs/ full coverage. | <ul style="list-style-type: none"> • Telephone interviews • Start up workshop – consultation • Excel sheet 4.3.1 • Case study narrative |
| 4. Existing human resource capacity in the WASH sector | In order to examine the shortage or gaps in service provision, examine the existing human resources in different organisations in the WASH sector, according to discipline, qualifications, and age (used as a proxy for years of experience). A representative sample | <ol style="list-style-type: none"> 1) Identify and quantify number of organizations in sector (public, private, NGO). 2) Select representative sample (to be agreed later). 3) Quantify the number of employees within organization according to each category of | <ul style="list-style-type: none"> • Secondary sources • Key informant interviews • Focus group discussions • Analyze quantitative data • Excel sheet 4.4 and narrative of case study • Case study narrative |

| | | | |
|---|---|--|--|
| | of organizations will need to be investigated which in combination with the total number of organizations can determine the country wide existing HR. | <p>organisations</p> <ol style="list-style-type: none"> 4) Multiply the average by number of organizations in country. 5) Identify skill set and composition of staff (level of education (PhD, MSc, B.Eng. or on the job training, age and gender). 6) Identify salaries and other benefits. | |
| 5. Assessing the supply of HR | In order to examine the shortage, there is a need to quantify the number and level of qualification of staff entering the WASH sector in different disciplines. | <ol style="list-style-type: none"> 1) Identify institutions that provide WASH training and assess the quality. 2) For each discipline, quantify the number of trainees per annum for the last 5years. 3) Determine percentage going into the WASH sector and calculate average values. 4) Quantify the number of on the job training offered by training institutions within the WASH sector. | <ul style="list-style-type: none"> • Key informant (number of institutions and percentage of graduates going into WASH sector) • Excel sheet 4.5 • Case study narrative – quality of training/education |
| 6. Quantifying the shortages and assessing the gaps | Shortages are calculated by the differences between the estimated demand and supply. Gaps will be determined on the basis of qualitative background information of employees (determined in 4.4.2) in combination with on the job training within organizations determined in 4.5.2. | <ol style="list-style-type: none"> 1) Per category list the difference between the existing HR demand determined in (4.3.1) and the existing HR (4.4.1). 2) Per category list the future HR demand (4.3.2). 3) Per category add the existing HR and the supply of HR (4.5.1). 4) Future HR demand – (existing HR and supply HR). 5) Per category use the skill set determined in 4.4.2 (existing HR) and compare it to on the job training (4.5.2) to show the HR gaps. | <ul style="list-style-type: none"> • Excel sheet 4.6 • Analyze the data • Case study narrative- write the analysis in a narrative |
| 7. Recommendations for meeting the shortages and gaps | On the basis of the shortages and gaps identified in 4.6 determine what additional supply needs to come from HR training institutions and or identification of alternative ways to meet the shortages (using the qualitative data retrieved, such as salaries, gender division, other sectors etc). | <ol style="list-style-type: none"> 1) Use the HR shortages to determine what additional HR supply is needed. 2) Use qualitative information retrieved to determine other ways to fill the shortages and gaps. | <ul style="list-style-type: none"> • Using data from key informant interviews, focus groups with diverse organisations in all previous steps • Case study narrative |

1.4 Key assumptions of the study

It was important to make a distinction between the water supply sector and sanitation sector. In this study we assumed that for water supply the time used for design and construction is 10% while the time for operation and maintenance is 85% and the time spent for promotion is 5%. For the sanitation sector, the study assumed that 20% of the time is used for construction, 5% time for Operation and Maintenance (O&M) and 75% for promotion.

2. SECTOR CONTEXT

2.1 *Background of WASH sector in Tanzania*

The current institutional framework for the provision of water supply and sanitation services in Tanzania is based on a separation between urban water supply and sewerage services, and rural water supply and sanitation services. It is a complex framework, both in law and in practice. It has a number of overlapping responsibilities, duplications and omissions. Furthermore, the mechanisms for effective consultation and consensus building, and participation of stakeholders in the decision-making process are not adequately defined and implemented.

The ultimate responsibility for the provision of water supply and sanitation services rests largely with the Ministry of Water Resources, and the current institutional framework has a central focus on the same Ministry. At the national level, there are other ministries that are also engaged, at different degrees of involvement, in the WASH sector. These ministries include Ministry of Health and Social Welfare, Ministry of Education and Prime Ministers Office (Local Government Authorities). However, a number of different central and local government departments or organizations have a mandate or legal requirements to be involved in various aspects of the provision of these services. In particular, local government, at all administrative levels e.g city, municipal, town, district, or township authority, has varying responsibility in providing water supply and sanitation services to the population in their areas, and the Ministry of Health has an overall responsibility for protecting public health through ensuring the provision of adequate sanitation and hygiene education by the local authorities.

In rural areas, the Government, External Support Agencies, and NGOs have been planning and constructing water supply schemes at village level, with little involvement or participation of the benefiting communities. The Government has also been the owner and operator of a number of these schemes. These approaches have led to lack of commitment by the beneficiaries to safeguard the facilities, and an unwillingness to contribute to the cost of operation and maintenance.

The lack of an effective institutional framework for integrated water supply and sanitation has led to:

- overlapping roles and responsibilities between various institutions leading to inefficient use of human and financial resources, duplication of effort, and gaps in effective provision of services;
- inadequate co-ordination between various government institutions;
- inadequate communication and awareness building between these institutions and local organizations and water users; and
- responsibility for regulation and performance monitoring of the provision of WSS services is being vested in the same organization responsible for service delivery and investment financing, thus creating a potential conflict of interest.

The lack of active participation of beneficiaries in the execution of water schemes in rural areas, has led to:

- poor performance of the WSS schemes;
- lack of proper management of the schemes;

- lack of ownership; and
- poor delivery of the service.

The main functions and responsibilities of each organization in the institutional framework is as shown in the Table 2.1 and the institutional framework is illustrated in Figure 2.1.

Table 2.1: Functional responsibilities for Water Supply and Sanitation (NAWAPO, 2002)

| Organization | Functions and responsibilities |
|---|--|
| Minister responsible for Water Resources management | -Presents national sector policy and strategy to Government. -Ensures policies and strategies are implemented. |
| Ministry responsible for Water Resources management | -Policy and strategy development. -Advises EWURA in formulation of technical guidelines and standards. -Co-ordinates planning for projects of national importance. -Secures finance for projects of national importance. -Monitors performance and regulates COWSOs. -Provides technical guidance to Councils. |
| Water Supply and Sanitation Authorities | -Own, manage and develop water supply and sanitation assets. -Prepare business plans to provide water supply and sanitation services, including capital investment plans. -Secure finance for capital investment, and relevant subsidies. -Contract and manage Service Providers. -Provide services not contracted out. -Formulate by-laws for service provision. |
| Service Providers | -Provide water supply and sanitation services in accordance with contractual requirements. -Collect revenues for services. |
| Community Owned Water Supply Organizations | -Own and manage water supply assets. -Operate and maintain water supply assets. -Determine consumer tariffs. -Collect revenue for the provision of services. -Contract and manage Service Providers. |
| Energy and Water Utilities Regulatory Authority | -Approves business plans of WSSAs. -Issues operating licenses to WSSAs. -Approves service tariffs. -Publishes technical guidelines and standards. -Monitors water quality and performance of WSSAs. -Collects and publishes comparative performance data. |
| President's Office Regional Administration and Local Government | -Co-ordinates planning of projects from local Government authorities. -Co-ordinates local government authority budgets. -Co-ordinates capacity building for local government authorities. |
| Regional Secretariat | -Representation on WSSA Boards. -Provides technical advice to local government authorities. |

| Organization | Functions and responsibilities |
|---------------------------------|--|
| Municipal and District Councils | <ul style="list-style-type: none">-Representation on WSSA Boards.-Co-ordinate WSSA budgets within Council Budgets. Disburse block grant funds to WSSAs.-Co-ordinate physical planning with WSSAs.Delegated performance monitoring and regulation of COWSOs. |
| Village Councils | <ul style="list-style-type: none">-Promote establishment of COWSOs.Representation on COWSO management body.-Co-ordinate COWSO budgets within Council Budgets.-Resolves conflicts within and between communities. |
| Ministry of Health | <ul style="list-style-type: none">-Develops policy, guidelines and strategies for sanitation.-Provides technical assistance to councils for sanitation.-Prepares Acts, Regulations and Standards for sanitation.-Monitors, regulates and provides support and advice to councils and other stakeholders on sanitation issues. |

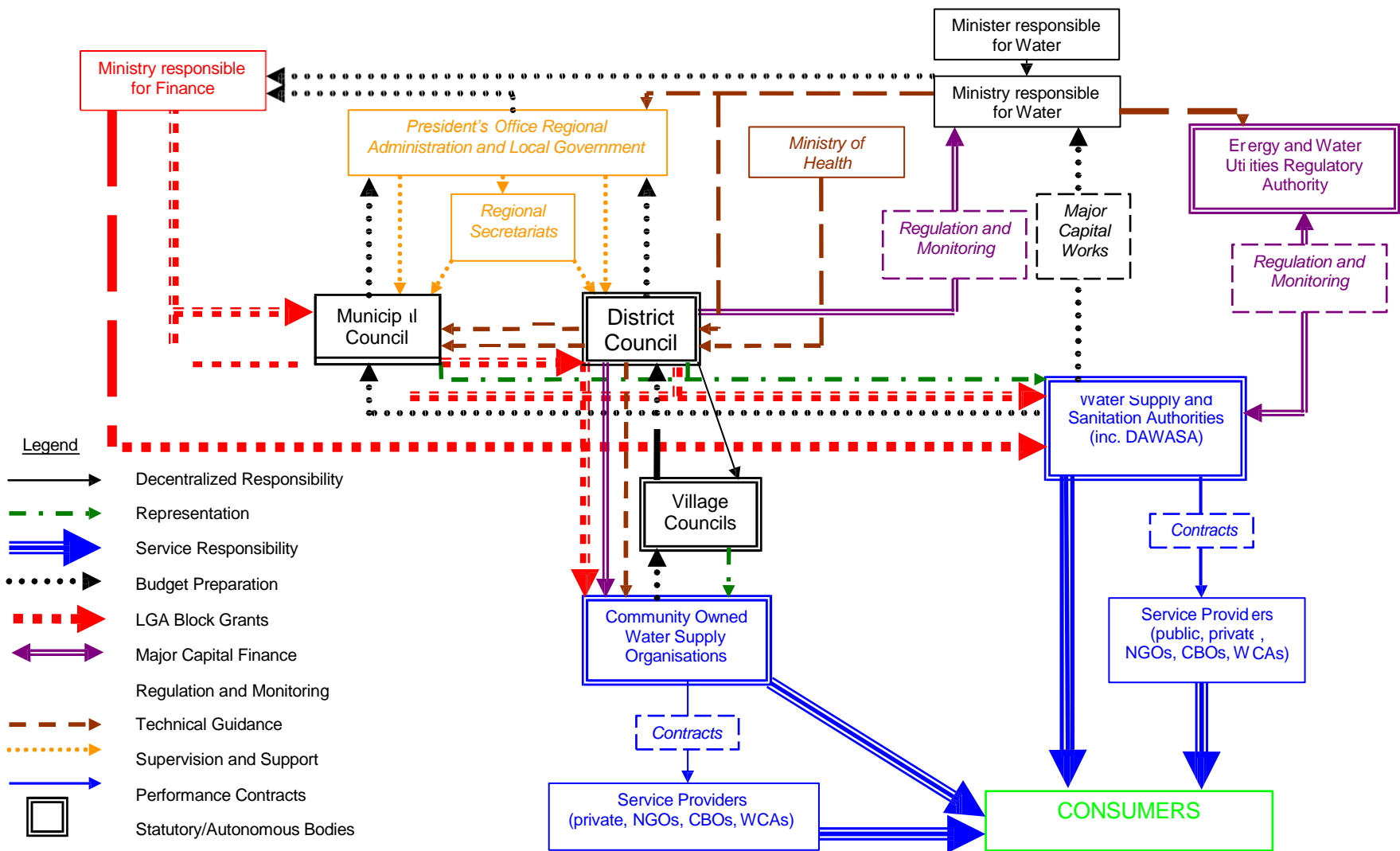


Figure 2.1 Final Institutional Framework for Water Supply and Sanitation in Tanzania (WSDP, 2006)

It is useful, within the institutional context of WATSAN in Tanzania, to highlight the key players and their roles. These key players are the main employers of the WATSAN human resource.

2.2 Key players in WatSan

2.2.1 Government

Central government ministries, such as the Ministry of Water Resources, have adopted a new role and strategy (“hands off, eyes on”) in policy and guideline formulation, coordination, monitoring and regulation. In rural and peri-urban areas, it is now clear that service delivery is the responsibility of the Local Government Authorities (e.g. direct implementation, contracting the private sector, partnership with NGOs and/or private sector). There is also the President’s Office for Regional and Local Government (PORALG) which is responsible for the functions of Regional and Local Government Authorities.

2.2.2 Communities

Rural and peri-urban communities are expected to prioritise and plan for their needs through participation in the Obstacles and Opportunities for Development (O&OD) planning process. They are expected to contribute to the capital costs (typically about 5%), and are then responsible for operation and maintenance of their water supply scheme.

2.2.3 NGOs / Civil Society

Distribution of local Civil Society CSOs is patchy with concentrations in Dar es Salaam, Arusha and refugee affected areas. Most are heavily dependent on external funding from large donors or INGOs.

There are relatively few local NGOs (LNGOs) in Tanzania with specific focus or expertise in the WatSan sector. A list of NGOs on WatSan is in the TAWASANET. An example is that WaterAid Tz currently works with nine LNGOs, including MAMADO in Dodoma, PEVODE in Dar es Salaam, HAPA and SEMA in Singida, and WATSANET which is a national network of NGO’s in WatSan. There are also faith-based organisations implementing water projects in some regions, though they are not many.

2.2.4 Private Sector

One of the objectives of the 2002 National Water Policy is to promote participation of the private sector in the delivery of goods and services, but this sector is relatively weak in taking up the challenges and assuming the roles it should address.

2.2.5 External Support Agencies (Donors and Banks)

Four major External Support Agencies in WatSan (the EU, World Bank, African Development Bank and German Government) are responsible for 80% of all external support. Other significant donors include French, Chinese, Japanese and Swiss

governments. Currently over 70% of these external funds are allocated to urban supplies, although only 23% of the population resides in urban areas, cities and towns.

2.3 Access to Improved Water and Sanitation services

2.3.1 Population and geographical spread

2.3.1.1 Existing and Future Populations in Urban and Rural Areas

The status of the population in Tanzania is summarized in the Table 2.2 below.

Table 2.2: Population distribution in Tanzania

| Setting Category (Settlement Sizes) | Population |
|-------------------------------------|-------------------|
| Dispersed rural (<10K) | 31,492,080 |
| Rural villages (10 K-50K) | 3,499,120 |
| Small town (50K – 100K) | 874,780 |
| Large towns (100K-0.5ML) | 3,499,120 |
| City (> 0.5ML) | 4,373,900 |
| Total | 43,739,000 |

Source: WHO, 2011

Table 2.2 shows that the current population of Tanzania stands at 43,739,000 people, with the majority living in dispersed rural setup.

2.3.1.2 Projected population

The future total population in Tanzania was calculated based on the percentage annual growth rate for both urban and rural areas. The population growth rates are summarized in Table 2.3.

Table 2.3: Population growth rates

| Setting Category | Annual Population Growth Rate (%) |
|------------------|-----------------------------------|
| Rural | 2.2 |
| Urban | 4.5 |

Source: UNICEF, 2011

Using the annual population growth rate for the two different setting, the population in Tanzania by 2015 which is the target for MDGs was estimated to be 49,914,707 people with the distribution as follows;

Table 2.4: Projected population in 2015

| Setting Category | Population |
|------------------|------------|
| Dispersed | 35,112,021 |
| Rural village | 3,901,336 |
| Small town | 1,090,135 |

| | |
|-------------------------|-------------------|
| Large town | 4,360,540 |
| City | 5,450,675 |
| Total Population | 49,914,707 |

Table 2.4 indicates that the population of Tanzania by 2015, when the MDGs are expected to be achieved, will be approximately 49,914,707.

2.3.2 Water and sanitation coverage in diverse settlements

The requirement for WATSAN facilities, for both rural and urban areas, was estimated using the existing water supply and sanitation coverage. Table 2.5 summarizes the existing coverage for WATSAN facilities in Tanzania.

Table 2.5: WATSAN Facilities Requirement

| WATSAN Facility Requirement | Coverage (%) |
|-----------------------------|--------------|
| Existing Rural Water Supply | 46.0 |
| Existing Urban Water Supply | 81.0 |
| Existing Rural Sanitation | 41.0 |
| Existing Urban Sanitation | 63.0 |

Source: JMP, 2010

2.4 Main types of improved water and sanitation service provision Used in Tanzania

In order for one to identify the key competences in WatSan, it is important to know the WatSan technologies that are currently used in Tanzania. In Tanzania, only three technologies are used in water supply and sanitation and are summarized in Table 2.6.

Table 2.6: Water Supply and Sanitation technologies used in Tanzania

| S/N | Water supply technologies | Sanitation technologies |
|-----|--|---------------------------------|
| 1 | Protected spring or shallow well with hand pump | Pit latrines (improved) |
| 2 | Piped scheme distributing water from borehole or spring to village or small town | Septic tanks and soak away pits |
| 3 | Piped scheme distributing water from surface source (lake, dam or river) used mainly for town and urban water supply | Sewerage systems |

Having summarized the main types of technologies used in WatSan in Tanzania, then it is important to identify the key competences that are needed to operationalise them. We have categorized two categories of competences, namely:

- (i) The ones that need to make the facilities (water supply and sanitation) in place.
- (ii) Those necessary for sustainability of the facilities.

Whereas the first category of competence leads into the competence of design and construction of new facilities, the second one will lead into competence in operation

and maintenance and community mobilization, sanitation and hygiene promotion. Community mobilization is important as it entails awareness creation and ownership of the facilities.

2.5 Key competences identified

Key WatSan competences required to meet the MDG's in Tanzania were identified and are highlighted below.

i) Water and sanitation: a person who is qualified or professionally engaged in a technical field specifically related to the provision of water and sanitation facilities or infrastructure (i.e. civil/environmental engineers).

ii) Other technical: a person who is qualified or professionally engaged in another technical field that is required in the planning, design or operation of water and sanitation facilities or infrastructure (e.g. hydro-geologists, mechanical/electrical engineers) but is not specific to water and sanitation sector

iii) Management and Finance: a person who is qualified or professionally engaged in management and finance (e.g. Managers (finance, HR, strategic) and office manager (administrative functions)) as well as a person who procures goods and services or a cost planner.

iv) Social development: a person who is qualified or professionally engaged in hygiene promotion or other relevant water, sanitation and health professions in the social sciences (e.g. health promotion specialist, sociologist, community development worker).

Details of job categories in Tanzania for the above competencies are presented in Annex 7. Under annex 7, the jobs on civil engineer, environmental engineer and sanitary engineer falls under WaterSan Engineers while Mechanical, electrical, electro-mechanical, hydrologist, hydro geologist, Water Chemist and Quantity Surveyor fall under Engineers. The jobs on Lawyer and sociology fall and social development while economics falls under Management and Finance

2.6 MDG targets/deficit and extent of coverage

2.6.1 MDG Targets

The MDG targets for Tanzania was calculated based on the 2000 baseline information and getting the WatSan percentage that would be covered if the MDGs will be achieved. Table 2.7 below summarizes the MGD targets for Tanzania both in rural and urban setting.

Table 2.7: MDG targets for Tanzania

| Setting and facility | MDG Target (%) |
|----------------------|----------------|
| Rural Water Supply | 66.9 |
| Urban Water Supply | 93.7 |
| Rural Sanitation | 95.0 |

| | |
|------------------|------|
| Urban Sanitation | 95.0 |
|------------------|------|

Using the MDG's targets in Table 2.7 and applying the methodological framework, the deficit in achieving MDGs in various population settings and deficit to achieve full coverage of WatSan in Tanzania were estimated as indicated in Table 2.8 and 2.9 respectively.

Table 2.8: MDG deficit in different population settings

| | |
|--|------------|
| RURAL POPULATION that needs to gain access to water for the MDGs to be met | |
| Dispersed rural communities | 9,003,585 |
| Rural villages | 1,000,398 |
| URBAN POPULATION that needs to gain access to water for the MDGs to be met | |
| Small town | 312,885 |
| Large town | 1,251,539 |
| City | 1,564,424 |
| RURAL POPULATION that needs to gain access to sanitation for the MDGs to be met | |
| Dispersed rural communities | 20,444,667 |
| Rural villages | 2,271,630 |
| URBAN POPULATION that needs to gain access to sanitation for MDGs to be met | |
| Small town | 484,517 |
| Large town | 1,938,068 |
| City | 2,422,584 |

Table 2.9: Deficit to achieve full coverage

| | |
|--|------------|
| RURAL POPULATION that needs to gain access to water for full coverage to be achieved | |
| Dispersed rural communities | 20,625,664 |
| Rural villages | 2,291,740 |
| URBAN POPULATION that needs to gain access to water for full coverage to be achieved | |
| Small town | 381,563 |
| Large town | 1,526,253 |
| City | 1,907,816 |
| RURAL POPULATION that needs to gain access to sanitation for full coverage to be achieved | |
| Dispersed rural communities | 22,200,268 |
| Rural villages | 2,466,696 |
| URBAN POPULATION that needs to gain access to sanitation for full coverage to be achieved | |
| Small town | 539,024 |
| Large town | 2,156,095 |
| City | 2,695,118 |

3. HUMAN RESOURCE (HR) DEMAND

3.1 Existing human resource demand

The existing Human Resources demand for achieving MDG and full service coverage was calculated based on the existing Watsan coverage in both rural and urban setup in design/construction, operating & maintenance and community mobilisation. The ideal HR composition was established from the report on “*Recommendation for the Structure of the District Water Departments (Annex 8)*” and also from the interviews. However, we couldn’t use the data from the report directly as the existing system has no capacity to accommodate the recommended structure and hence our analysis was based on the interviews, particularly on what could be the ideal number of HR to deliver the services.

In the computation process, an assumption was made on the distribution of the human resource in the different categories in both water supply and sanitation. As highlighted in section 1.4, it was assumed that 10% of the total HR in water supply was engaged in construction while 85 and 5 percent was engaged in operational & maintenance and community mobilization respectively. For sanitation, the assumed respective ratios were 20, 5 and 75 percent.

Table 3.1 highlights the existing HR demand in different set ups and presents the national wide status of the demand for different categories of Watsan professions based on serving the existing population (2010 baseline). The HR demand was established using the methodological framework developed by IWA. The demand follows the settlement pattern in the country and which presents a huge demand in the Watsan technical fields for dispersed communities’ nationwide. It was also observed that the comparative lower number of Other technical field category could be attributed by the fact that Water and environmental Engineers were mostly handling jobs and assignments which would normally be undertaken by a mechanical engineer, a hydrologist or even electrical engineer.

Low existing HR demand in the small towns and cities could be attributed to the fact that majority of graduate professionals in all categories are more attracted to work in the cities and major urban towns. The same trend is also observed for companies and NGOs where most of the programs and activities are centred in major towns and cities and thus creating an impression of low existing demand in cities and portraying a huge demand in dispersed rural settlements.

Table 3.1 Existing human resource demand as computed using the methodological framework

| | WATSAN technical field | Other technical field | Management & finance | Social development |
|--|------------------------|-----------------------|----------------------|--------------------|
| Existing HR demand in dispersed communities nationwide | 7,061 | 985 | 4,269 | 2,791 |
| Existing HR demand in rural village nationwide | 785 | 109 | 474 | 310 |
| Existing HR demand small town nationwide | 785 | 109 | 474 | 310 |
| Existing HR demand large towns nationwide | 785 | 109 | 474 | 310 |

| | | | | |
|--|--------------|--------------|--------------|--------------|
| Existing HR demand in cities | 94 | 13 | 57 | 38 |
| TOTAL EXISTING HR DEMAND NATIONWIDE | 9,508 | 1,327 | 5,749 | 3,760 |

3.2 Human resource demand for achieving MDGs

Using the existing HR demand (cf. Table 3.1) per 10 000 population for different settlements nationwide in different HR categories, it was possible to estimate the required Human Resource capacity to achieve MDGs, using the population figures of achieving MDGs. Table 3.2 and 3.3 below present the Human Resource needed in achieving MDGs by 2015 for water supply and sanitation sectors respectively.

Tables 3.2 Future human resource demand in achieving MDGs for water supply

| FUTURE HR DEMAND FOR WATER IF ACHIEVING MDGs | WATSAN technical field | Other technical field | Management & finance | Social development |
|---|------------------------|-----------------------|----------------------|--------------------|
| Water delivery: dispersed rural communities | 4,899 | 490 | 2939 | 735 |
| Water delivery: rural villages | 544 | 54 | 327 | 82 |
| Water delivery: small towns | 213 | 21 | 128 | 32 |
| Water delivery: large towns | 852 | 85 | 511 | 128 |
| Water delivery: city | 1,065 | 107 | 639 | 160 |
| Total HR Demand for Water Supply Sector | 7,574 | 757 | 4,544 | 1,136 |

Table 3.3: Human resource demand in achieving MDGS for sanitation sector

| FUTURE HR DEMAND FOR SANITATION IF ACHIEVING MDGs | WATSAN technical field | Other technical field | Management & finance | Social development |
|--|------------------------|-----------------------|----------------------|--------------------|
| Sanitation delivery: dispersed rural communities | 522 | 348 | 348 | 1913 |
| Sanitation delivery: rural villages | 58 | 39 | 39 | 213 |
| Sanitation delivery: small towns | 16 | 11 | 11 | 59 |
| Sanitation delivery: large towns | 65 | 43 | 43 | 238 |
| Sanitation delivery: city | 81 | 54 | 54 | 297 |
| Total HR Demand for Sanitation Sector | 742 | 494 | 494 | 2,720 |

Table 3.2 and 3.3 above highlights that the total HR demand for achieving MDG in water supply and sanitation (adding Table 3.2 & 3.3) is estimated at 8,316, 1,252, 5,039 and 3,856 for Watsan technical field, Other technical field, Management and Finance and Social development respectively. The high existing HR demand

compared to the future HR demand for achieving the MDGs is as a result of less coverage to be achieved in 2015 and the use of 2010 vs 2015 population figures

3.3 Human resources demand for achieving full service coverage

Using the existing demand for different settlements nationwide in different HR categories, it was possible to estimate both Human Resource capacity to achieve full service coverage. Table 3.4 and 3.5 below present the total Human Resource needed for achieving full service coverage for water supply and sanitation sectors respectively.

Table 3.4: Human resource demand for full coverage in water supply sector

| FUTURE HR DEMAND FOR WATER IF ACHIEVING FULL COVERAGE | WATSAN technical field | Other technical field | Management & finance | Social development |
|--|------------------------|-----------------------|----------------------|--------------------|
| Water delivery: dispersed rural community | 7,323 | 732 | 4394 | 1098 |
| Water delivery: rural village | 814 | 81 | 488 | 122 |
| Water delivery: small towns | 227 | 23 | 136 | 34 |
| Water delivery: large towns | 909 | 91 | 546 | 136 |
| Water delivery: city | 1,137 | 114 | 682 | 171 |
| Total HR Demand for Water Supply Sector | 10,410 | 1,041 | 6,246 | 1,562 |

Table 3.5: Human resource demand for full coverage in sanitation sector

| FUTURE HR DEMAND FOR SANITATION IF ACHIEVING FULL COVERAGE | WATSAN technical field | Other technical field | Management & finance | Social development |
|---|------------------------|-----------------------|----------------------|--------------------|
| Sanitation delivery: dispersed rural communities | 549 | 366 | 366 | 2014 |
| Sanitation delivery rural villages | 61 | 0 | 0 | 0 |
| Sanitation delivery: small towns | 17 | 11 | 11 | 63 |
| sanitation delivery: large towns | 68 | 45 | 45 | 250 |
| Sanitation delivery: city | 85 | 57 | 57 | 313 |
| Total HR Demand for Sanitation Sector | 781 | 480 | 480 | 2,639 |

Adding Tables 3.4 and 3.5 we find that the total HR demand for achieving full coverage in water supply and sanitation is estimated at 11,191, 1,521, 6,726 and 4,201 for Watsan technical field, Other technical field, Management and Finance and Social development respectively. The numbers for technical fields could be due to the fact that with construction one engineer often performs various projects.

4. EXISTING HR CAPACITY

4.1 Sectoral human resources setup

4.1.1 Public service providers (urban water authorities)

The set up of most of water service provider's institutions is categorized into three major departments i.e. technical, commercial and business departments. In all utilities and institutions interviewed it was established that there were no social services departments in most of the service providers. For example, the water departments in the Districts relied on the services of the social workers from the District Social department. The overall Country institutional set up regarding sanitation bestow sanitation services under the Ministry of Health, under a department within the Municipal Councils.

A. *Technical Department.*

This department comprises five sections as follows:

- *Production section* - is responsible for the management of the water source, pumping unit, treatment facilities and storage tanks.
- *Water network section* - deals with operation and maintenance of water supply and distribution.
- *Maintenance and repair section* - deals with of mechanical and electrical installation in the service supply system, and maintenance of the machine and carpentry workshop.
- *Planning designing and construction section* - deals with day to day functions of planning and budgeting, designing and drawings, construction and drawings, construction works installation of new connections maintenance of buildings and reporting.
- *Sewerage departments* are provided within institutional set up but only a few are functional.

It was found that a significant number of workforce, in most of the cases up to 70% of the workforce turn over, were casual workers engaged on a temporary basis supporting the technical department staff. The geographical spread of most of the districts necessitate having this arrangement where casual labour would attend to the need of the system within their locations (a village tap, intake or an isolated tank) which would normally be very far from the district headquarters. Most often, some of these casual labourers develop hands on skills over time.

B. *Finance and administration department* –is headed by the Finance and Administration Manager and has the following sections:

- *Revenue section*- which is charged with the responsibility for revenue collection and record keeping.
- *Expenditure section*- which is responsible for payments, preparation of financial reports and bank reconciliation statements.
- *Supplies sections*- which deal with the supplies and procurements forwarding and clearing and store record keeping.
- *Personnel and administration*- is charged with the responsibility for dealing with the personnel matters, general administration issues, transport and security.

C. *Business department*- headed by Business Manager and has three sections as follows:

- *Customer records and billing section-* deals with meter reading, meter repair and servicing, reconciliation of customer bills preparation and distribution of bills and maintenance of customer records. Other includes disconnection and reconnection of supply system.
- *Customer relations and business section-* deals with the customer care, information dissemination, customer survey, attending to customer complaints and dealing with issues.
- *Credit control section-* deals with the functions of debt analysis and tracking for their payment and follow up payment of water bills.

4.1.2 NGO and private companies

Consulting firms engaged during the study were found to offer specialized services in water supply design, implementation (construction supervision) having acquired experience by working with foreign based companies involved in development projects. It was generally observed that there is no organization or firm institution, which was interviewed, which had sanitation as a section or department and hence their capacity on sanitation was only outsourced and on temporary basis.

Most of the NGOs had majority of their activities centered on capacity building programs and hygiene promotion. The caliber of professionals within an NGO greatly depended on the nature of ongoing programs but overtime most of them would tend to specialize and develop expertise. It was generally observed that majority of the NGOs had a higher number of Social Mobilization staff i.e. sociologists and community workers and almost all of them had at least one Water/sanitation Engineer and one Financial manager. It was also observed that nearly half of the NGOs sampled had the Water/sanitation Engineer as a program Manager where more often than not he/she would be busy with managerial duties rather than the professional input. However no analysis was done to study the impact of this trend to the overall performance of the NGOs

4.1.3 District Councils

The National Water Policy of Tanzania came at a time when local government reforms were being developed. Under the new structure, District Councils became the leading institutions in implementation of rural development projects including water supply and sanitation. The District Water Engineers are responsible to manage and coordinate all water development projects. The District Water Engineer is responsible for the whole WatSan sector in the district and in most cases the Water Engineer also handles other issues like pumps operations, hydrology, water resources management etc.

As for the hygiene and sanitation promotion, the water department seldom has an expert of its own. The District Social officer often is called to attend meetings and only engages in WatSan issues when need arise.

4.1.4 Community

The past practice was that WatSan systems were provided in communities by the government without the later being involved in the planning. The communities were passive recipients of projects. As a result they regarded these systems as belonging to government and had no real sense of ownership. Under the new National Water Policy (2002) and through active advocacy and participation of CBOs , NGOs and

some government projects, some Watsan projects are now being run at community level and management is fully under the community.

Table 4.1 summarises the subsector roles and responsibilities as provided in the National Water Policy (year 2002).

Table 4.1: Functions of different players under the new National Water Policy (year 2002)

| Player | Functions |
|--------------------|---|
| Central Government | Policy formation and information on policy, training/capacity building, coordination, monitoring, and regulatory functions. |
| District Councils | Overall planning, resource allocation, and coordination of the implementation of community water and sanitation projects |
| Private Sector | Provision of goods and services for construction, maintenance, and software aspects (e.g. mobilization and training) |
| Community | Identifying needs, expressing demand, planning, participation in siting and construction, operation, and maintenance |

4.2 Skill set of the HR in the sub-sectors

4.2.1 Education

The level of education and skills needed in various subsectors was assessed. It was established that in the entire organisation sampled i.e., public, private and NGOs, they all had at least one qualified graduate Engineer specifically related to WATSAN who was normally an overall manager leading a department. In almost all the cases this Engineer had necessary skills and experience to manage the activities under the department. In all the Urban Authorities sampled, the Managing Directors were competent WATSAN Engineers who besides leading the management were also responsible for the technical matters of the utility.

One of the key questions in the questionnaire that was administered to all sample organizations was on the readiness of fresh graduates to start engaging in all aspects of work assignments. This question was aimed at getting an understanding of any mismatch between the graduate curriculum and job realities as experienced by the respective organizations. The general feeling in most of the organizations interviewed was that fresh graduates cannot handle work assignments on their own unless under supervision of an experienced personnel. In most cases, the newly employed graduates undergo an induction process and possibly a job's-on training to facilitate them get to the practical realities of the theoretical background of which they would have covered in their curriculum.

Due to strict fiscal regulation in the country, it was found that more than 90% of the Finance and Management departments were being led by qualified managers with a degree or diploma. In most cases, the financial manager was also responsible for Human Resources management of the organisation.

In the study, it was established that sanitation engineering was not an education qualification (structured curriculum) offered by any institution in the country and hence in the entire sampled organisations there were no trained sanitation engineering professionals.

4.2.2 Experience

Before sector reorganisation to align to the new National Water Policy, when the Central Government was responsible for service provision, staff qualification and promotion was merited based on long experience. This led to non qualified staff holding senior management position both in technical and financial department.

During this study, over 90% of responded confirmed that both education and experience were important factors in meriting promotion and on determining remuneration.

4.2.3 Rural Vs Urban

According to the National census of 2002 as well as data from JWP, over 80% of the Tanzania population lives in rural areas. However as it can be seen from results presented in section 3, the Watsan service coverage for the rural set up is way below the coverage for urban setup. This is also attributed to the low number of Watsan staff serving the rural population. The Ministry of Water has a Division of Rural Water Supply and sanitation solely responsible for planning and directing policy towards water resources development in rural areas of Tanzania.

NGOs / CBOs presence in urban/rural

The presence of NGOs and CBOs is more pronounced in rural areas than it is in urban settings because the WatSan services in rural settings are still poor. The NGOs are trying as much as possible to act as the voice of rural people but also trying to advocate for their needs.

At District council, the few staff is always torn between servicing the majority voiceless poor and the noisy minority but influential population living in and around District headquarters. It was established that there is no division of labour based on rural/urban setup both at District and in urban Authorities. It was observed that the District staff spent more than half of their time in rural areas than compared with time spent in urban settings. However it was difficult to relate this to their direct productivity because of the vastness of some of the Districts. For example it takes good 8 hours of return trip to move from the HQ of Kilosa District Council to the furthest village on a good 4 X4 utility Land-cruiser. It is also a common knowledge that when public staff spent a night out of their working station they are given allowances. This is an important income to supplement their small salaries and in a way this could be a motive to spend more time in villages than strategically planning.

4.2.4 Female/Male distribution

Gender distribution among Watsan staff in the entire subsector is not planned or designed. Nearly 90% of all organisations sampled had males representing Watsan technical fields. The department of Commercial and Administration had a fair representation of gender with nearly 40% of the sampled organisation having 50-50% distribution of gender among their staff. NGOs and CBOs demonstrated having a higher ratio of female staff particular in the social category. This could be attributed by the supply side where according to the list of students enrolling in social studies, nearly 90% of students were reported to be females while it was the opposite case for all cadres of training on the technical side.

4.2.5 Salaries and benefits

All respondents (100%) reported that salaries and remuneration was entirely dependent on academic qualification with experience being an advantage in adding

up remuneration package. A professional field like Engineering, registration with the professional body like Engineers Registration Board will indicate one as being well experienced and qualified. The salary levels for Watsan engineers were observed to range between \$ 800-1200 per month. Private organisation had a higher range of salary scales but the Government employment seems to offer easy opportunity for further training and job security. There is little incentive to work in the rural settlements particularly for Finance and administrative managers. This could be due to the fact that the financial regulations and procedure requires that entities must have these carders but more often than not they end up doing manual routine works (below) their capacity and this trend tends in the long run de-motivates and lower the staff morale to work. Similarly most of the financial and administrative experts whose input is mostly IT based tends to think rural posting will isolate them from technological advancement.

5. HUMAN RESOURCES SUPPLY

5.1 Overview of Provider Institutions and Project

5.1.1 Engineering Education and Training Capacities (Artisans, Technicians and Engineers)

In Tanzania, engineering education and training is offered by six institutions namely; College of Engineering and Technology (CoET) at the University of Dar es Salaam (UDSM), Sokoine University of Agriculture (SUA), Ardhi University (ARU), Dar es Salaam Institute of Science and Technology (DIT), Mbeya Institute of Science and Technology (MIST) and St. Joseph Institute of Science and Technology. Technical education and training is offered by more than 33 training institutions including DIT, MIST, Arusha Technical College, Rwegarulila Water Resources Institute and Karume Technical College while training of artisans is overseen by the Vocational Education and Training Authority (VETA). Currently, VETA has 22 designated model centres including 11 Regional Vocational Training and Services Centres (RTSCs), 10 Vocational Training Centres (VTC) and 1 Vocational Instructors Training College (VITC). In addition, there are about 900 vocational training centers owned by religious institutions, NGOs, CBOs and other private organizations/institutions.

5.1.2 Projects

There are currently two big projects in Tanzania with the objective to provide training for different HR categories. The projects are World Bank project and Water Sector Development Programme (WSDP).

5.1.2.1 The World Bank Project

A significant improvement in training facilities is expected to be realized from implementation of the World Bank project which was launched recently (2008). However, it should be noted that the proposed sub-projects under World Bank funding were developed to address the existing bottlenecks in the training institutions at the current level of student enrolments and related training needs. Additional financial input shall therefore be required if the requirements to cater for the proposed student enrolment levels in engineering and technology training are to be achieved.

5.1.2.2 Water Sector Development Programme

The WSDP is a Government-led initiative with financing from various development partners including the French Development Agency. The main objective of the WSDP in Tanzania is poverty reduction through ensuring community access to clean water

of acceptable standards including meeting proper health, environmental and economic standards. Poverty reduction and economic growth is linked to access to basic social services. The National Strategy for Growth and Reduction of Poverty (NSGRP/MKUKUTA) highlights the vital importance of water provision services and water resources management for social development and its contribution to the Millennium Development Goals (MDGs), which aims to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. One of the main components of WSDP is training.

Despite the fact that there has been two main projects on providing/supplying the HR required for achieving the objectives of different developmental frameworks including MDGs, the respective projects have not specified the number of targeted people to be trained as an output.

5.2 Current Supply

5.2.1 Vocational Training Institutions (Artisans)

Engineering works involve artisans, technicians and engineers. In order to evaluate the capacity of engineering education and training (supply of Human Resources), all three strands of engineering practice need to be analyzed. The enrolments and number of graduate artisans in various zones for year 2007 are as shown in Table 5.1. The trades and modules designated for the purpose of Trade Testing, Teachers Certifications and Assessment by VETA are Civil Trades, Mechanical Trades, Electrical trades and technician certificates. The list in Table 5.1 highlights the trades offered by the vocational training institutions that are relevant to WatSan sector.

There have been complaints from the market that the quality of graduates currently existing from our institutions is going down. Among other reasons advances are;

i) Inappropriate training and ill equipped training institutions – The problem of increasing access to water and sanitation is not just associated with the total number of workers but the quality of the training. Often recently qualified staffs lack some important competences that are needed for work in the WASH sector. As well as outdated curricula, standards of teaching can be linked to poor incentives due to low salaries and a general lack of resources. This was evidenced during the study in which when one of the institutions was visited only to see that there were no equipments in the engineering field in order for engineering students to get hands on training. Moreover in another institutions laboratory equipments were outdated to an extent that staff could not educate in a proper manner. Also, salaries of the trainers were indicated as a reason not to be motivated.

ii) Lack of opportunities for practical WASH related work experience – The lack of opportunities for graduates to get practical WASH-related experience is a significant problem. This is compounded by inadequate support for the transition from academia to the work environment and lack of mentors to train less experienced staff. For WASH courses and engineering in general, students have to be exposed to the practical problems happening in the real world. This can only happen if the institutions of higher learning can provide practical oriented course. It was found in this study that most academic institutions don't provide practical work focusing on WASH though practical training (PT) is provided at some institutions.

iii) Gender inequalities – WASH is a male dominated sector; the case study has demonstrated clear gendered occupational boundaries, with men and women tending to do different jobs in the sector; with men working more on water supply and women more on hygiene promotion. In general, there is a low level of women graduates from universities especially from technically orientated courses. The low representation of

women in technical and managerial positions can be linked to a failure to promote careers in the sector to young women and a lack of policy incentives to recruit more women.

Table 5.1: Enrolment and graduates of VTI in Tanzania (mainland); 2007

| ZONE | Enrolment | | | Graduants | | |
|---------------|---------------|---------------|----------------|---------------|---------------|---------------|
| | Male | Female | Total | Male | Female | Total |
| Northern | 13,451 | 13,919 | 27,370 | 13,347 | 12,860 | 26,207 |
| Dar es Salaam | 12,226 | 12,712 | 24,938 | 9,617 | 10,342 | 19,959 |
| Lake | 8,592 | 7,596 | 16,188 | 7,407 | 5,593 | 13,000 |
| South West | 4,404 | 3,786 | 8,190 | 3,223 | 2,648 | 5,871 |
| Highlands | 3,899 | 3,807 | 7,706 | 2,954 | 2,396 | 5,350 |
| South East | 3,789 | 2,654 | 6,443 | 3,239 | 2,357 | 5,596 |
| Central | 3,433 | 2,816 | 6,249 | 3,328 | 2,646 | 5,974 |
| Eastern | 2,508 | 2,166 | 4,674 | 2,500 | 2,138 | 4,638 |
| Western | 1,521 | 1,750 | 3,271 | 1,388 | 1,623 | 3,011 |
| Total | 53,823 | 51,206 | 105,029 | 47,003 | 42,603 | 89,606 |

Source: VET Catalogue, 2007

5.2.2 Technician Training Institutions (Technicians)

The current capacities for training technicians and enrolment levels in the various institutes are shown in Table 5.2, for institutions that have full registration with National Council for Technical Education (NACTE), and Table 5.3 for those with provisional registration status, with focus on WatSan.

Table 5.2: WatSan engineering related enrolment and capacities of training Institutes with NACTE Full Registration Status (2008)

| S/N | Institution | Ownership | Enrolment | | | | | | Overall Total | Overall Capacity |
|---|--|-----------|-------------|---|----------|------------------|------------|--------------|---------------|------------------|
| | | | Certificate | | | Ordinary Diploma | | | | |
| | | | M | F | Total | M | F | Total | | |
| Civil, Mechanical & Electrical Engineering | | | | | | | | | | |
| 1 | Dar es Salaam Institute of Technology | Govt | | | 0 | 1,212 | 153 | 1,365 | 1,365 | 1,200 |
| 2 | St. Joseph's College of Engineering and Technology – DSM | Private | | | 0 | 363 | 53 | 416 | 416 | 720 |
| 3 | Mbeya Institute of Science and Technology | Govt | | | 0 | 395 | 43 | 438 | 438 | 645 |
| 4 | National Institute of Transportation - DSM | Govt | | | 0 | 293 | 73 | 366 | 366 | 600 |
| 1 | Technical College Arusha | Govt | | | 0 | 372 | 53 | 425 | 425 | 500 |
| 2 | Rwegarulila Water Resources Institute | Govt | | | 0 | 162 | 16 | 178 | 178 | 405 |
| 3 | Karume Technical College | Govt | | | 0 | 137 | 32 | 169 | 169 | 360 |
| | Subtotal | | | | 0 | 2,934 | 423 | 3,357 | 3,357 | 4,430 |
| Other Specializations | | | | | | | | | | |

| S/N | Institution | Ownership | Enrolment | | | | | | Overall Capacity | |
|-----|---|-----------|-------------|-----------|-----------|------------------|------------|--------------|------------------|---------------|
| | | | Certificate | | | Ordinary Diploma | | | | Overall Total |
| | | | M | F | Total | M | F | Total | | |
| 1 | Ardhi Institute Tabora | Govt | 64 | 34 | 98 | 17 | 8 | 25 | 123 | 160 |
| 2 | Misungwi Community Development Technical Training Institute | Govt | | | 0 | 188 | | 188 | 188 | 160 |
| 3 | Ardhi Institute Morogoro | Govt | | | 0 | 35 | 6 | 41 | 41 | 100 |
| | Subtotal | | 64 | 34 | 98 | 240 | 14 | 254 | 352 | 420 |
| | Grand Total | | 64 | 34 | 98 | 3,174 | 437 | 3,611 | 3,709 | 4,850 |

Source: NACTE Database

Table 5.3: WatSan Engineering related enrolment and capacities of training Institute with NACTE provisional registration status (2008)

| S/N | Institution | Ownership | Enrolment | | | | | | Overall Capacity | |
|---|---|-----------|-------------|---|----------|------------------|-----------|------------|------------------|---------------|
| | | | Certificate | | | Ordinary Diploma | | | | Overall Total |
| | | | M | F | Total | M | F | Total | | |
| Civil, Mechanical & Electrical Engineering | | | | | | | | | | |
| 1 | St. Joseph's Institute of Information and Technology – Songea | Private | | | 0 | 81 | 24 | 105 | 105 | 400 |
| | Subtotal | | | | 0 | 81 | 24 | 105 | 105 | 400 |

Source; NACTE Database

5.2.3 Higher education training institutions (Engineers)

5.2.3.1 Existing engineering education programmes and capacities

Tanzania currently has six higher learning institutions offering degrees in engineering and other related education and training. The engineering programmes that are offered by these institutions are shown in Table 5.4.

Table 5.4: WatSan related engineering programmes offered by higher learning Institutions in Tanzania and current annual intake capacities (2008/09)

| Programmes | Institution | | | | | | Total |
|---|-------------|-----|-----|-----|------|----------|------------|
| | CoET | SUA | ARU | DIT | MIST | St. JIST | |
| BSc. in Chemical and Process Engineering | 45 | | | | | | 45 |
| B. in Civil Engineering | | | | 120 | 80 | 60 | 260 |
| BSc. in Civil and Structural Engineering | 50 | | | | | | 50 |
| BSc. in Civil and Transportation Engineering | 50 | | | | | | 50 |
| BSc. in Civil and Water Resources Engineering | 50 | | | | | | 50 |
| BSc. in Construction | | | 30 | | | | 30 |

| Programmes | Institution | | | | | | Total |
|---|-------------|-----|------------|------------|------------|------------|--------------|
| | CoET | SUA | ARU | DIT | MIST | St. JIST | |
| Management | | | | | | | |
| B. in Electrical Engineering | | | | 70 | 40 | | 110 |
| BSc. in Electrical Engineering | 15 | | | | | | 15 |
| BSc. in Electrical Power Engineering | 15 | | | | | | 15 |
| B. in Electrical and Electronics Engineering | | | | | | 60 | 60 |
| B. in Electronics and Communication Engineering | | | | | | 70 | 70 |
| B. in Electronics and Telecommunication Engineering | | | | 120 | | | 120 |
| BSc. in Electro Mechanical Engineering | 25 | | | | | | 25 |
| BSc. in Environmental Engineering | | | 50 | | | | 50 |
| BSc. in Environmental Laboratory Science and Technology | | | 60 | | | | 60 |
| BSc. in Environmental Science and Management | | | 30 | | | | 30 |
| BSc. in Housing and Infrastructure Planning | | | 40 | | | | 40 |
| BSc. in Land Management and Valuation | | | 100 | | | | 100 |
| BSc. in Municipal and Industrial Services Engineering | | | 30 | | | | 30 |
| B. in Mechanical Engineering | | | | 60 | 40 | | 100 |
| BSc. in Mechanical Engineering | 40 | | | | | | 40 |
| BSc. in Property and Facilities Management | | | 30 | | | | 30 |
| BSc. in Real Estate (Finance and Investment) | | | 30 | | | | 30 |
| BSc. in Rural Development Planning | | | 30 | | | | 30 |
| BSc. in Urban and Regional Planning | | | 100 | | | | 100 |
| Totals | 290 | | 530 | 370 | 160 | 190 | 1,540 |

From Table 5.4, the total annual training capacity for WatSan related engineering courses in higher learning institutions is 1,540. This training capacity, together with other related professional courses in all the training institutions is too low by any standards. Thus, as per 2008 statistics, the annual WatSan related engineers supply for all the engineering offering institutions stand at **89,606 artisans, 3,940 technicians and 1,120 engineers**. (These figures are additions from Tables 5.1 to 5.4). Using the synthesized information from different academic (higher learning institutions) and training institutions supply that offer WatSan related courses, the study established the human resource supply in WatSan for Tanzania as shown in Table

5.5. to get the HR supply in Table 5.5, the study first established the institutions offering the competences studied, namely WatSan technical fields, Other technical fields, Management and Finance and Social Development. From the numbers established, the study assumed percentage going into water supply and sanitation sectors for different disciplines. Then an annual HR supply per year and 2015 for water supply and sanitation sectors were respectively estimated.

Table 5.5: HR Supply for WatSan related courses in Tanzania

| TYPE OF TRAINING INSTITUTION | WATSAN technical field | Other technical field | Management & finance | Social development |
|---|------------------------|-----------------------|----------------------|--------------------|
| University | 324 | 383 | 883 | 246 |
| Other higher education | 168 | 204 | 220 | 149 |
| Training institutes | 345 | 100 | 0 | 100 |
| Vocational training | 0 | 0 | 0 | 0 |
| Percentage going into the water sector | 70% | 1% | 5% | 10% |
| Percentage going into the sanitation sector. | 2% | 1% | 1% | 1% |
| Total estimate of HR supply to WATER sector per year | 586 | 7 | 55 | 50 |
| Total estimate of HR supply in WATER sector to 2015 | 2930 | 34 | 276 | 248 |
| Total estimate of HR supply to SANITATION sector per year | 17 | 7 | 11 | 5 |
| Total estimate of HR supply in SANITATION up to 2015 | 84 | 34 | 55 | 25 |

From the study, the estimated HR supply for WatSan technical field, Other technical fields, management and finance and social development in water sector to meet the MDG's in 2015 was estimated to be 2,930, 34, 276 and 248 respectively. For sanitation sector in the same competences, the HR supply was estimated to be 84, 34, 55 and 25 respectively. This shows that more HR will be available for water sector than for sanitation sector. It is interesting to note that the trend for HR supply for both water supply and sanitation up to 2015 is upward. The upward trend for HR supply in Tanzania has been to a large extent attributed to higher learning education policy that direct all the institutions in the country to increase the number of students graduating in different disciplines, engineering being one of them. A number of economic development frameworks like Vision 2025, MKUKUTA and to achieve the MDGs by 2015 also call for increase in graduates. It was again a directive by the president of Tanzania on 2008 to the engineers registration board (ERB) to increase the number of engineers

6. QUANTIFYING SHORTAGES AND ASSESSING THE GAPS TO MEET MDG'S IN 2015

6.1 The HR demand of the broad categories and different setting

The exercise of quantifying the national HR shortages in WatSan started with quantifying the HR demand for both rural and urban settings for the four identified competences namely WatSan technical field, Other technical field, Management and Finance and Social Development. Table 6.1 below summarizes the future HR demand for both water supply and sanitation sector if MDGs are to be achieved.

Table 6.1: Future HR demand for WatSan if MDGs are to be achieved

| HR DEMAND | WATSAN technical field | Other technical field | Management & finance | Social development |
|--|------------------------|-----------------------|----------------------|--------------------|
| FUTURE HR DEMAND FOR WATER IF ACHIEVING MDGs | | | | |
| Rural | 5,443 | 544 | 3266 | 817 |
| Urban | 2,130 | 213 | 1278 | 320 |
| Total HR Demand for achieving MDG in water Sector | 7,573 | 757 | 4,544 | 1,137 |
| FUTURE HR DEMAND FOR SANITATION IF ACHIEVING MDGs | | | | |
| Rural | 580 | 386 | 386 | 2,126 |
| Urban | 162 | 108 | 108 | 594 |
| Total HR Demand for achieving MDG in sanitation | 742 | 494 | 494 | 2,720 |
| TOTAL HR DEMAND FOR ACHIEVING MDG | 8,316 | 1,252 | 5039 | 3856 |

The above table shows that for water supply sector the HR demand for WatSan is highest (7,573 HR), with more demand in rural areas where majority of Tanzania population is living. The lowest HR demand is for social development standing at 320, with less demand of the same in the urban areas. For the sanitation sector, the highest HR demand is on social development of which was estimated at 2,126, with the lowest being Other technical field, Management and Finance each standing at 108. The geographic setting that demands more HR for sanitation is rural of which was estimated at 580, while urban setting demand was only 162. The results suggest that for sanitation, the most important aspect is the software component and that is why the demand is higher while for water supply the important aspect is infrastructure.

On the other hand, the quantification of the shortages for HR in WatSan in Tanzania was preceded by quantifying the existing HR for the competences of WatSan technical fields, Other technical fields, Management and Finance and Social Development for NGOs, Private and Public Sectors. The different sectors sampled and visited are explained in the Methodology section. Table 6.2 summarizes the existing HR for different sectors.

Table 6.2: Existing HR for WatSan for different competences in Tanzania

| HR CAPACITY | WATSAN technical field | Other technical field | Management & finance | Social development |
|--|-------------------------------|------------------------------|---------------------------------|---------------------------|
| NGOS | | | | |
| Water | | | | |
| Existing HR capacity in water | 80 | 40 | 120 | 120 |
| Sanitation | | | | |
| Existing HR capacity in NGO sanitation | 11 | 11 | 15 | 15 |
| PRIVATE SECTOR | | | | |
| Water | | | | |
| Existing HR capacity in private sector organizations in water | 175 | 50 | 50 | 25 |
| Sanitation | | | | |
| Existing HR capacity in private sector organizations in sanitation | 10 | 5 | 0 | 10 |
| PUBLIC SECTOR | | | | |
| Water | | | | |
| Existing HR capacity in public sector organizations in water | 525 | 38 | 300 | 75 |
| Sanitation | | | | |
| Existing HR capacity in public sector organizations in sanitation | 0 | 0 | 0 | 0 |
| TOTAL NUMBER WORKING IN WATER | 780 | 128 | 470 | 220 |
| TOTAL NUMBER WORKING IN SANITATION | 21 | 16 | 20 | 25 |

Table 6.2 indicates that HR capacity in water supply sector for different categories i.e WatSan technical fields, Other technical fields, Finance and Management and Social Development is 780, 128, 470 and 220 respectively while for the same competences in sanitation sector the number is 21, 16, 20 and 25 respectively. The result shows that there is more HR for water supply than it is for sanitation sector. The results also show that NGOs have fewer HR for WatSan technical fields (80) compared to public sector (525). Interestingly it is to note that the NGOs have more HR for Sanitation sector than for private and public sectors. This explains the focus/emphasis that NGOs have on changing the behaviour about sanitation practices and hand washing.

6.2 HR shortages for the Water Supply and Sanitation Sector

On overall the HR shortages to achieve the MDGs in Tanzania is summarized in Table 6.3;

Table 6.3: Shortages of HR for WatSan to achieve MDGs and full service coverage in Tanzania

| QUANTIFYING THE SHORTAGES | WATSAN technical field | Other technical field | Management & finance | Social development |
|---|------------------------|-----------------------|----------------------|--------------------|
| WATER SECTOR | | | | |
| HR shortage for achieving MDG | 3,864 | 596 | 3,799 | 669 |
| HR shortage for achieving full service coverage | 6,701 | 879 | 5,500 | 1094 |
| SANITATION SECTOR | | | | |
| HR shortage for achieving MDGs | 637 | 444 | 419 | 2670 |
| HR shortage for achieving full service coverage | 676 | 430 | 405 | 2589 |

The table above indicates that more staff within the WatSan Technical field will be required to achieve MDGs for water supply i.e HR of 3,864 than it is for sanitation i.e 637 but there is more shortage in social development in sanitation i.e HR capacity of 2,670 than it is for water supply i.e 669 HR. This explains that as far as sanitation sector is concerned, more software is required than hardware as compared to water supply where more hardware is required than software. The relatively low shortage for WatSan technical field in sanitation could be attributed by the fact that as far as sanitation is concerned in Tanzania, behaviour change is more important than putting the facilities in place. This is also evidenced by high shortage of social development in sanitation sector.

The sector as a whole, indicated to be specifically short of environmental engineers, programme officers and technical officers within the broader Watsan technical field category. In the social development category, they seemed to be lacking numerous sanitation marketing/ community empowerment offices. The reasons for these kinds of gaps for social development category could be due to the fact that these skills are not taught in the formal system of our higher education institutions which is largely probably due to curricula in our education systems not addressing these skills and knowledge. The gap on environmental engineers could be due to either environmental engineers are not interested to work in water sector or the water sector doesn't employ them effectively.

6.3 HR shortages different work areas, construction, O&M and community mobilization

In quantifying the HR shortages for different work areas, it was important to apportion the time allocated for each. It was again important to make a distinction between the water supply sector and sanitation sector. Again, as highlighted in previous sections, it was assumed that for water supply the assigned time used for design and construction is only 10% while the time for operation and maintenance is 85% and the time spent for promotion is 5%. For sanitation sector the study assumed that 20% of the time is used for design and construction, 5% of time for Operation and Maintenance (O&M) and 75% for promotion. Using this proportion of the assigned time for different competences the study established the HR shortages as summarized in Table 6.4 below.

Table 6.4: HR shortages for different competences

| Water Supply | | | |
|------------------------|---------------------|----------------|---------------------|
| | Design/Const | O&M | Mobilization |
| WatSan technical field | 386 | 3284 | 193 |
| Other technical field | 60 | 507 | 30 |
| Finance and Management | 380 | 3229 | 190 |
| Social Development | 67 | 569 | 34 |
| Total | 893 | 7,589 | 447 |
| Sanitation | | | |
| WatSan technical field | 127 | 32 | 478 |
| Other technical field | 89 | 22 | 333 |
| Finance and Management | 84 | 2 | 314 |
| Social Development | 534 | 21 | 2003 |
| Total | 834 | 77 | 3,128 |

The above shows that the HR shortages in Tanzania for water supply are highest for O&M i.e 7,589 HR and lowest in mobilisation which was estimated at 447 HR. This can be probably attributed to the need of more maintenance of the infrastructure for the sustainability of the services. However, the sanitation sector has the highest HR shortage in mobilisation and lowest in O&M of which was estimated at 3,128 and 77 HR respectively. It can be explained that the highest shortage for mobilisation calls for more software component in sanitation than hardware part. The lowest HR shortage is for O&M in sanitation indicates that a big portion of sanitation technology is not that complex to require frequent O&M. The high shortage for O&M in water supply sector could be attributed by the fact that in the classical/traditional delivery of WASH course, not much emphasis is given to O&M. On the other hand the high shortage for social development for sanitation sector is attributed to not many people in this discipline would like to work in sanitation sector because of lack of incentive to work in this sector, or sanitation is not competitive economically with other sector.

6.4 Rural vs. urban HR capacity Shortages

In order to get the HR capacity shortages for different settings it was important to look into the proportion of population living in different settings in Tanzania. It was established that, for Tanzania, about 80% live in rural areas while only 20% live in urban areas. Rural setting included dispersed rural where the population living there was < 10,000, and rural villages in which it was defined to have population of 10,000-50,000. Population of more than 50,000 was considered to be an urban setting. Table 6.5 below shows the HR shortage for different settings.

Table 6.5: Shortages of HR for Urban and Rural Settings

| QUANTIFYING THE SHORTAGES | WATSAN technical field | Other technical field | Management & finance | Social development |
|----------------------------------|------------------------|-----------------------|----------------------|--------------------|
| WATER SECTOR | | | | |
| HR shortage for achieving MDG | 3864 | 596 | 3799 | 669 |
| Rural | 3091 | 477 | 3039 | 535 |
| Urban | 773 | 119 | 760 | 134 |

| SANITATION SECTOR | | | | |
|--------------------------------|-----|----|-----|------|
| HR shortage for achieving MDGs | 637 | 44 | 419 | 2670 |
| Rural | 510 | 35 | 335 | 2136 |
| Urban | 127 | 9 | 84 | 534 |

Table 6.5 highlights that the highest HR shortage in meeting the MDGs in water supply sector is within WatSan technical fields estimated at 3,864 HR of which is mainly in the rural setting. The lowest shortage are other technical fields estimated at 119 HR and mainly in urban setting. In the rural and urban areas, there is a shortage of 7,142 and 1,786 HR respectively to meet the MDGs. This explains the need for having more WatSan technical professionals in rural areas to put up the relevant facilities in place. For the sanitation sector, the highest shortage is on WatSan technical professionals estimated at 510 HR of which majority are in the rural setting while the urban setting has a shortage of 127 HR. This could be probably due to the fact that currently there is no any institution that is providing education solely on sanitation education. The high shortage of HR of all sorts of jobs in rural settings both for water supply and sanitation sector could be due to the fact that many HR would prefer to work in urban areas to rural areas. Qualified personnel don't like to work in rural areas as they find the areas to be socially backward and lack of services especially for young and fresh engineers who would like to stay in urban areas.

6.5 HR Shortages in different types of Organizations (NGO, Private, Public)

In order to establish the HR for different types of organisation, it was first important to establish the proportion of existing HR for different organisations to the total available HR. The proportion for existing HR for different organisations to the total existing HR is summarized in the table below;

Table 6.6: Proportion of Existing HR for different Types of Organisation

| Type of Organization | WATSAN technical field | Other technical field | Management & finance | Social development |
|----------------------|------------------------|-----------------------|----------------------|--------------------|
| NGOs | 0.11 | 0.34 | 0.26 | 0.56 |
| | 0.50 | 0.66 | 1.00 | 0.60 |
| Private | 0.19 | 0.34 | 0.09 | 0.09 |
| | 0.48 | 0.31 | 0.00 | 0.40 |
| Public | 0.70 | 0.32 | 0.65 | 0.35 |
| | 0.02 | 0.02 | 0.00 | 0.00 |

The table above shows that for Water Supply sector more WatSan are found in public sector (0.7) than in the private sector (0.11) and NGOs (0.19). This can be explained by the fact that the public sector is more interested in building (putting up) the water facilities in place and that the public sector seems to employ Watsan enegeiers. This means that more WatSan technical professionals are needed in the NGOs and private sector than in the public sector. However, for sanitation sector, more WatSan are available for NGOs (0.5) than for private (0.48) and public (0.02) sectors. It is however interesting to note that for social development competence, NGOs have a higher proportion of existing HR (0.56 and 0.6) than for private and

public sectors. This explains that the NGOs are more focusing on software component that it is for hardware component. It is urged that for sustainability of WatSan services software components are more important than hardware component. The number of HR shortages for different types of organisation is summarised in the table below;

Table 6.7: HR Shortage for Different Types of Organization

| Organization | WATSAN technical field | Other technical field | Management & finance | Social development |
|---------------------|------------------------|-----------------------|----------------------|--------------------|
| NGO (WS) | 425 | 203 | 988 | 375 |
| Sanitation | 319 | 293 | 419 | 1602 |
| Private (WS) | 734 | 203 | 342 | 60 |
| Sanitation | 306 | 138 | 0 | 1068 |
| Public (WS) | 2705 | 191 | 2470 | 245 |
| Sanitation | 13 | 9 | 0 | 0 |

The above table shows that in order to achieve the MDGs for WatSan in Tanzania for water supply, more WatSan (2,705 HR) are required in public sector than in NGOs and Public Sector. The job that is more needed in public sector is watsan engineers. This could be probably due to the fact that the interest for public sector is putting up the water facilities/infrastructure in place and this the public sector needs more engineers. Less WatSan technical professionals for water supply will be required in the NGOs (425 HR). However for Sanitation Sector, more WatSan and Social Development will be required in NGOs than in private and public sectors. This can be explained by the role played by NGOs on changing the behaviour in as far as sanitation is concerned. For the same sector (sanitation) the HR shortage for NGOs is 319 HR (WatSan technical field) and 1,602 HR for social development. The corresponding figures for private and public sectors are 1068 HR, and 0 HR respectively. It still appears for sanitation sector that the public sector doesn't need more social development as public sector focus is on infrastructure. The results show the importance of NGOs in sanitation sector but also the need to focus on software component for the sanitation sector.

6.6 Assessment of Gaps for Different Categories

Besides looking at shortages (numbers), this study also was meant to evaluate the gaps (for different categories of the jobs indentified in the study). This sort of information is crucial to understand whether it is numbers that the country is lacking in terms of job categories described to meet the MDGs, or skills and competencies. The following section briefly explains the type of gap that was identified in this study;

Technical fields (WATSAN specific and non-WATSAN specific)

Under this type of job, the study found that there was a particular lack of;

- Project design and planning,
- Analytical skills
- Lack of knowledge regarding to Integrated Water Resources Management (IWRM)
- Monitoring and Evaluation,
- Operation of some facilities

- Writing skills and design particularly use of software
- Communication skills

Social Development

Within the Social Development HR category, the study indicated that the following skills were more needed;

- Advocacy, Lobbying and Good Governance
- There are also few trained socio workers trained at University levels dealing with sanitation
- Community mobilization

There was however no gap identified and reported in the course of study survey under the Management and Finance job category. This was indicated in the questionnaire that no any specific skills were specifically in demand from this type of job.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

From the study, the following can be concluded;

- For water supply the HR demand for WatSan is highest more being demanded in the rural areas where majority of Tanzania population is living. The lowest demand is HR for social development, the less demanded being in the urban areas.
- More WatSan technical professionals will be required to achieve MDGs for water supply than it is for sanitation but more social development for sanitation (42,403) than it is for water supply. This explains that as far as sanitation sector is concerned, more software is required than hardware as compared to water supply where more hardware is required than software.
- HR shortage in Tanzania for water supply is the highest for O&M and lowest for mobilisation. This can be probably attributed to the need of more maintenance of the infrastructure for the sustainability of the services. However on the other hand the sanitation sector has the highest shortage on mobilisation and lowest for O&M. It can be explained that the highest shortage for mobilisation calls for more software component in sanitation than hardware part.
- For Water Supply Sector, the highest shortage is on WatSan technical professionals this being observed in the rural setting. The lowest shortage is within the other technical field category being estimated in urban setting.
- In order to achieve the MDGs for WatSan in Tanzania for water supply, more WatSan are required in public sector than in NGOs and Public Sector. Less WatSan for water supply will be required in the NGOs). However for Sanitation Sector, more WatSan and Social Development will be required in NGOs than in private and public sectors.

7.2 Recommendations

Based on the analyzed information and from key informants, the following are recommended

7.2.1 Recommendations to increase the supply of trained staff

- i) Increase support for training institutions** – There is a pressing need to improve standards of teaching as part of continuing education of WASH professionals. Additional funding is needed for universities, colleges and other training institutions to enable them to upgrade the quality of their educational activities.
- ii) More work experience opportunities for students** – There is also a need for more work placements for students in the sector and for employers and educational institutes/ training institutes to communicate with one another more coherently regarding sector needs.

iii) Focus on skills required for asset management and O&M – The MDG targets have provided the political incentive to invest in new facilities, but more attention is needed to improve skills for operation and maintenance.

iv) Short-term courses – There is a specific need for a more strategic and structured approach for the organization and delivery of short-term courses which need to be better institutionalized within existing training institutions.

v) Vocational courses – On-the-job vocational training is required and staff who has received training should be encouraged to share their new knowledge with their peers as part of in-house vocational training. There is also a need for a range of 'quick win' training initiatives to develop essential skills/ competencies in areas that can produce rapid results. In particular, these include community-based sanitation and hygiene promotion.

ii) Ensure professionals have a broad skills base – There is a specific need to attract professionals with a broader base of skills (notably social scientists) to work in the WASH sector.

iii) Specific focus on capacity development in small towns and rural areas – Institutions need to ensure that the most qualified individuals are not all centered in the larger cities. Specific attention is required to deploy and retain the workforce to ensure access to and provision of services across the country on an equitable basis. To support this, ways should be found to speed up the decentralization process, with transfer of additional functions – and funds – to local authorities. Building adequate HR capacity for drinking water and sanitation can only be achieved in the context of broader civil service reform policies in place.

iv) Incentives – Underlying these recommendations is a need to offer more competitive employment packages and opportunities for career development combined with a system of rewards to incentivise workers. For instance there is a need for an incentive structure to encourage the deployment of staff to rural and remote areas. Performance related pay and bonuses for exceeding targets may act as strong incentives to improve performance, motivate and retain staff and to encourage capacity development. These are private sector principles that have been successfully used in public sector service providers, but there is a need for these principles to be adopted more widely.

v) Addressing the gender imbalance – There is a need to understand why there are still a relatively small proportion of women working in the sector. For women to play a more significant role in meeting predicted future demands for WASH sector workers, it is clear that more girls should be encouraged to gain technical qualifications and employers' preferences should be reshaped to ensure that women participate in the labour market on more equal terms

7.2.2 Institutional support for human resource development

Evidently the effectiveness of individuals is highly dependent upon them having the right skills required for the tasks that they are expected to perform. However, for staff to realize their potential it is very important they are able to access the right equipment to carry out their task effectively. This is particularly apparent for district level public sector institutions whose jobs are seen to be undermined by the lack of access to transport and communications equipment. Although there is evidently a need for targeted programmes to enable training institutions increase both the

quantity and quality of qualified individuals, the challenges related to human resources capacities listed above need to be addressed as part of comprehensive national level sector development plans.

The case study support the need for increased clarity between national level agencies about their institutional roles, but also the need for a single agency with a clear mandate to co-ordinate human resource development within the sector. In support of this, more work is needed to better understand the relationship between the number of organizations working in the national WASH sector, the levels of capacity available and how this aligns with national HR priorities, policies and strategies. A database to collate information and act as a HR register at the national level would potentially be a very useful tool to support sector development.

7.3 Study observations

The study found that reliable estimates of people working in the WatSan sector, from the developed methodological framework perspective, are difficult to obtain due to the fact that available information is often incomplete and generally unreliable. The methodological framework proposed is data intensive. The lack of data has implications in assessing existing and estimating future skills shortages. Nonetheless, notwithstanding the inaccuracies of the data, the case study has shown that the supply of qualified staff entering the workforce is insufficient for various reasons as have been explained in section 5.2.1 of the main report

ANNEXES



MEETING THE WATER AND SANITATION MDGs

A STUDY OF HUMAN RESOURCE DEVELOPMENT REQUIREMENTS IN TANZANIA

Annex 1: Questionnaire

Quantify HR capacity

1. What are the total numbers of full time employees working for your organisation?
2. Explain the 4 categories as shown in Table 1 below;
 - o How would you assign your employees to these categories?
 - o What number of Watsan engineers, engineers, management and finance, and social development workers are there working in your organisation? (fill out in table 1)

Table 1: Distribution of workers over the categories

| | WATSAN technical field | Other technical field | Management & finance | Social development |
|---|------------------------|-----------------------|----------------------|--------------------|
| Number of employees (full time) on water | | | | |
| Number of employees (full time) on sanitation | | | | |

- How many of these are working rurally/urban? (please keep into account what you have found out during preparation)
- What percentage of workers within the categories are males and what percentage is female? (enter this information into table 2)

Table 2: Overview of the distribution of capacity

| Position | Location – urban/rural | Male/female (%) |
|---------------------------|------------------------|-----------------|
| 1. Water and sanitation | | |
| 2. Other technical field | | |
| 3. Management and finance | | |
| 4. Social development | | |

- Please try to map each category separately in table 3 (1 table for watsan, 1 table for other technical fields etc) and list the number of workers according to degree and age.
- What is the working ratio?
- What specific skills are specifically in demand?

- Do you find your employees to have significant skills to perform their job? (This element is crucial to identifying HR capacity gap)
- Do you offer on the job training?
 - For what sort of positions

Table 3: Copy this map so as to enter per category per organization the numbers of workers in that age/education group.

| Age/ education | High school | Diploma | BSc | MSc | PhD | On the job training only |
|-------------------|----------------|---------|-----|-----|-----|--------------------------------|
| >50 years | | | | | | |
| 40-50 years | | | | | | |
| 30-40 years | | | | | | |
| 20-30 years | | | | | | |
| >20 years | | | | | | |

Table 4: Organizational analysis of staffing (full time positions)

| Position | Basic Monthly Salary | other benefits |
|---------------------------|----------------------|----------------|
| 1. Water and sanitation | | |
| 2. Other technical field | | |
| 3. Management and finance | | |
| 4. Social development | | |

- Can you indicate the salary? (Enter in table 4)
- How is salary comprised? Is it dependent on education or years of experience?
- Can you indicate any benefits / incentive schemes (table 4)
- Is there a large staff turnover?
- What is roughly the annual attrition? And what is the main reason.
- Do you have any vacancies that need to be filled?
- What sort of vacancy takes longest to fulfil? Why? (location, attractiveness, lack of skills)
- Is it difficult to find the expert with the right expertise and practical knowledge? Do you feel the employees within the organisation are skilled enough for their position?
- What is your experience with the usability of graduates entering the sector
 - Do they have sufficient knowledge?
 - Do they have practical knowledge?
- To your opinion how good is the degree of fit between the training and education provided and the practical working reality.

Annex 2: List of Key Informants

1. Eng Tano DWE Bunda
2. ENG John Msengi DWE Kahama Shinyanga
3. Prosper Kessy General Manager Kiliwater
4. Jones Mbike Technical Manager Kigoma UWRSA
5. Eng Nyanda, DWE Nachingwea
6. Dr Relise, Project Coordinator GIZ Dar es Salaam
7. Eng Alex Kaaya, S. Engineer Ministry of Water Dar es salaam
8. Mr Deus Masige, Executive Director TEEs
9. Boniface Mwita Technical Manager MUWASA

Annex 3: Reference List of documents collected and reviewed

Joint Monitoring Programme (JMP) Reports - 2010

Ministry of Water and Livestock Development (2005): Human capacity needs assessment for water resources management and development in Tanzania

National Water Policy of Tanzania – NAWAPO (2002)

The United Republic of Tanzania, Ministry of Water and Irrigation (2008):

National Water Sector Development Strategy 2006-2015.

Water Sector Development Programme (WSDP) - 2006

WaterAid Reports

Annex 4: Study area map



Annex 5: HR Methodology and Results

| HR methodology: Calculate existing and future populations in urban and rural areas | | | |
|---|--------------------------------------|------------|--|
| Section | Required | | |
| 4.1.1 | Existing total population | 43,739,000 | |
| | Dispersed rural (<10K) | 31,492,080 | |
| | Rural villages (10 K-50K) | 3,499,120 | |
| | Small town (50 K- 100K) | 874,780 | |
| | Large town (100K -0.5 MI) | 3,499,120 | |
| | City (> 0.5ML) | 4,373,900 | |
| | | | |
| 4.1.2 | Future total Population 2015 | | |
| | Rural population growth (percentage) | 2.20% | |
| | Urban population growth (percentage) | 4.50% | |
| | | | |
| | Future: dispersed | 35,112,021 | |
| | Future: rural village | 3,901,336 | |
| | Future: small town | 1,090,135 | |
| | | | |
| | Future: large town | 4,360,540 | |
| | Future: city | 5,450,675 | |

| HR methodology: Calculate existing requirements for WATSAN facilities | | |
|--|---|----------|
| Section | Required | |
| 4.2.1 | Existing rural water coverage percentage (2010) | 46% |
| | Rural water coverage (population numbers) | |
| | Dispersed rural communities | 14486357 |
| | Rural villages | 1609595 |
| | Existing urban water coverage percentage (2010) | 81% |
| | Urban water coverage (population numbers) | |
| | Small town | 708572 |
| | Large town | 2834287 |
| | City | 3542859 |
| | Existing rural sanitation coverage percentage (2010) | 41% |
| | Rural sanitation coverage (population numbers) | |
| | Dispersed rural communities | 12911753 |
| | Rural villages | 1434639 |
| | Existing urban sanitation coverage percentage (2010) | 63% |

| | | |
|--|---|---------|
| | Urban sanitation coverage (population numbers) | |
| | Small town | 551111 |
| | Large town | 2204446 |
| | City | 2755557 |

| HR methodology: Calculate existing requirements for WATSAN facilities | | |
|--|---|----------|
| 4.2.2 | MDG TARGETS | |
| | Rural water MDG targets (percentages) | 67% |
| | Urban water MDG targets (percentages) | 94% |
| | Rural sanitation MDG targets (percentages) | 95% |
| | Urban sanitation MDG targets (percentages) | 95% |
| | | |
| | RURAL POPULATION that will have access to water if MDG targets are achieved | |
| | Dispersed rural communities | 23489942 |
| | Rural villages | 2609994 |
| | URBAN POPULATION that will have access to water if MDG targets are achieved | |
| | Small town | 1021457 |
| | Large town | 4085826 |
| | City | 5107283 |
| | RURAL POPULATION that will have access to sanitation if MDG targets are achieved | |
| | Dispersed rural communities | 33356420 |
| | Rural villages | 3706269 |
| | URBAN POPULATION that will have access to sanitation if MDG targets are achieved | |
| | Small town | 1035628 |
| | Large town | 4142513 |
| | City | 5178141 |
| | | |
| | MDG DEFICIT IN POPULATION NUMBERS | |
| | RURAL POPULATION that needs to gain access to water for the MDGs to be met | |
| | Dispersed rural communities | 9003585 |
| | Rural villages | 1000398 |
| | URBAN POPULATION that needs to gain access to water for the MDGs to be met | |
| | Small town | 312885 |
| | Large town | 1251539 |
| | City | 1564424 |
| | RURAL POPULATION that needs to gain access to sanitation for the MDGs to be met | |
| | Dispersed rural communities | 20444667 |
| | Rural villages | 2271630 |

| | | |
|--|--|----------|
| | URBAN POPULATION that needs to gain access to sanitation for MDGs to be met | |
| | Small town | 484517 |
| | Large town | 1938068 |
| | City | 2422584 |
| | | |
| | DEFICIT TO ACHIEVE FULL COVERAGE | |
| | RURAL POPULATION that needs to gain access to water for full coverage to be achieved | |
| | Dispersed rural communities | 20625664 |
| | Rural villages | 2291740 |
| | URBAN POPULATION that needs to gain access to water for full coverage to be achieved | |
| | Small town | 381563 |
| | Large town | 1526253 |
| | City | 1907816 |
| | RURAL POPULATION that needs to gain access to sanitation for full coverage to be achieved | |
| | Dispersed rural communities | 22200268 |
| | Rural villages | 2466696 |
| | URBAN POPULATION that needs to gain access to sanitation for full coverage to be achieved | |
| | Small town | 539024 |
| | Large town | 2156095 |
| | City | 2695118 |

HR methodology: Estimate existing and future HR demand

| Section | Required | WATSAN technical field | Other technical field | Management & finance | Social development |
|---------|--|------------------------|-----------------------|----------------------|--------------------|
| 4.3.1 | HR DEMAND (PER 10,000 POPULATION) | | | | |
| | WATER: CONSTRUCTION | | | | |
| | Water delivery dispersed rural community | 0.21 | 0.021 | 0.1251 | 0.031 |
| | Water delivery rural village | 0.21 | 0.021 | 0.1251 | 0.031 |
| | Water delivery small town | 0.21 | 0.021 | 0.1251 | 0.031 |
| | Water delivery large town | 0.21 | 0.021 | 0.1251 | 0.031 |
| | Water delivery city | 0.21 | 0.021 | 0.1251 | 0.031 |
| | Total construction | 1.04 | 0.104 | 0.6257 | 0.156 |
| | WATER: OPERATION AND MAINTENANCE | | | | |
| | Water delivery dispersed rural community | 1.77 | 0.177 | 1.0637 | 0.266 |

| | | | | | |
|--|---|--------------|--------------|---------------|--------------|
| | Water delivery rural village | 1.77 | 0.177 | 1.0637 | 0.266 |
| | Water delivery small town | 1.77 | 0.177 | 1.0637 | 0.266 |
| | Water delivery large town | 1.77 | 0.177 | 1.0637 | 0.266 |
| | Water delivery city | 1.77 | 0.177 | 1.0637 | 0.266 |
| | Total O&M | 8.86 | 0.886 | 5.3184 | 1.330 |
| | WATER: COMMUNITY MOBILISATION | | | | |
| | Water delivery dispersed rural community | 0.10 | 0.010 | 0.0626 | 0.016 |
| | Water delivery rural village | 0.10 | 0.010 | 0.0626 | 0.016 |
| | Water delivery small town | 0.10 | 0.010 | 0.0626 | 0.016 |
| | Water delivery large town | 0.10 | 0.010 | 0.0626 | 0.016 |
| | Water delivery city | 0.10 | 0.010 | 0.0626 | 0.016 |
| | Total community mobilisation | 0.52 | 0.052 | 0.3128 | 0.078 |
| | TOTAL WATER HR DEMAND PER 10,000 | 10.43 | 1.043 | 6.2569 | 1.564 |
| | SANITATION: CONSTRUCTION | | | | |
| | Sanitation delivery dispersed rural community | 0.03 | 0.021 | 0.0209 | 0.115 |
| | Sanitation delivery rural village | 0.03 | 0.021 | 0.0209 | 0.115 |
| | Sanitation delivery small town | 0.03 | 0.021 | 0.0209 | 0.115 |
| | Sanitation delivery large town | 0.03 | 0.021 | 0.0209 | 0.115 |
| | Sanitation delivery city | 0.03 | 0.021 | 0.0209 | 0.115 |
| | Total construction | 0.16 | 0.104 | 0.1043 | 0.574 |
| | SANITATION: OPERATION AND MAINTENANCE | | | | |
| | Sanitation delivery dispersed rural community | 0.01 | 0.005 | 0.0052 | 0.029 |
| | Sanitation delivery rural village | 0.01 | 0.005 | 0.0052 | 0.029 |
| | Sanitation delivery small town | 0.01 | 0.005 | 0.0052 | 0.029 |
| | Sanitation delivery large town | 0.01 | 0.005 | 0.0052 | 0.029 |
| | Sanitation delivery city | 0.01 | 0.005 | 0.0052 | 0.029 |
| | Total O&M | 0.04 | 0.026 | 0.0261 | 0.143 |

| | SANITATION: COMMUNITY MOBILISATION, SANITATION AND HYGIENE PROMOTION | | | | |
|--|---|------------------------|-----------------------|----------------------|--------------------|
| | Sanitation delivery dispersed rural community | 0.12 | 0.078 | 0.0782 | 0.430 |
| | Sanitation delivery rural village | 0.12 | 0.078 | 0.0782 | 0.430 |
| | Sanitation delivery small town | 0.12 | 0.078 | 0.0782 | 0.430 |
| | Sanitation delivery large town | 0.12 | 0.078 | 0.0782 | 0.430 |
| | Sanitation delivery city | 0.12 | 0.078 | 0.0782 | 0.430 |
| | Total community mobilisation | 0.59 | 0.391 | 0.3911 | 2.151 |
| | TOTAL SANITATION HR DEMAND PER 10,000 | 0.78 | 0.521 | 0.5214 | 2.868 |
| | | WATSAN technical field | Other technical field | Management & finance | Social development |
| | Existing HR demand in dispersed communities nationwide | 7061 | 985 | 4269 | 2791 |
| | Existing HR demand in rural village nationwide | 785 | 109 | 474 | 310 |
| | Existing HR demand small town nationwide | 785 | 109 | 474 | 310 |
| | Existing HR demand large towns nationwide | 785 | 109 | 474 | 310 |
| | Existing HR demand in cities | 94 | 13 | 57 | 38 |
| | TOTAL EXISTING HR DEMAND NATIONWIDE | 9508 | 1327 | 5749 | 3760 |

| HR methodology: Estimate existing and future HR demand | | | | | |
|---|--|------------------------|-----------------------|----------------------|--------------------|
| Section | Required | | | | |
| 4.3.2 | HR DEMAND (PER 10,000 POPULATION) | WATSAN technical field | Other technical field | Management & finance | Social development |
| | HR DEMAND FOR ACHIEVING MDGS | | | | |
| | FUTURE HR DEMAND FOR WATER IF ACHIEVING MDGS | | | | |
| | Water delivery: dispersed rural communities | 42,282 | 3383 | 27060 | 6765 |
| | Water delivery: rural villages | 522 | 42 | 334 | 84 |
| | Water delivery: small towns | 51 | 4 | 33 | 8 |
| | Water delivery: large towns | 817 | 65 | 523 | 131 |
| | Water delivery: city | 1,277 | 102 | 817 | 204 |

| | | | | | |
|--|--|--------|------|-------|-------|
| | FUTURE HR DEMAND FOR SANITATION IF ACHIEVING MDGs | | | | |
| | Sanitation delivery: dispersed rural communities | 4,803 | 2402 | 2402 | 16812 |
| | Sanitation delivery: rural villages | 59 | 30 | 30 | 208 |
| | Sanitation delivery: small towns | 4 | 2 | 2 | 14 |
| | Sanitation delivery: large towns | 66 | 33 | 33 | 232 |
| | Sanitation delivery: city | 104 | 52 | 52 | 362 |
| | TOTAL HR DEMAND FOR ACHIEVING MDG | 49,986 | 6114 | 31286 | 24820 |
| | | | | | |
| | FUTURE HR DEMAND FOR FULL SERVICE COVERAGE | | | | |
| | FUTURE HR DEMAND FOR WATER IF ACHIEVING FULL COVERAGE | | | | |
| | Water delivery: dispersed rural community | 63,202 | 5056 | 40449 | 10112 |
| | Water delivery: rural village | 780 | 62 | 499 | 125 |
| | Water delivery: small towns | 55 | 4 | 35 | 9 |
| | Water delivery: large towns | 872 | 70 | 558 | 140 |
| | Water delivery: city | 1,363 | 109 | 872 | 218 |
| | | | | | |
| | FUTURE HR DEMAND FOR SANITATION IF ACHIEVING FULL COVERAGE | | | | |
| | Sanitation delivery: dispersed rural communities | 5,056 | 2528 | 2528 | 17696 |
| | Sanitation delivery rural villages | 62 | 0 | 0 | 0 |
| | Sanitation delivery: small towns | 4 | 2 | 2 | 15 |
| | sanitation delivery: large towns | 70 | 35 | 35 | 244 |
| | Sanitation delivery: city | 109 | 55 | 55 | 382 |
| | | | | | |
| | TOTAL FUTURE HR DEMAND IF ACHIEVING FULL SERVICE COVERAGE | 71,573 | 7921 | 45033 | 28941 |

HR methodology: existing HR capacity in the sector

| | | WATSAN technical field | Other technical field | Management & finance | Social development |
|-----|-------------------------------|------------------------|-----------------------|----------------------|--------------------|
| 4.4 | HR CAPACITY | | | | |
| | NGOS | | | | |
| | Water | | | | |
| | Average number of ... | 2 | 1 | 3 | 3 |
| | Total number of NGOs in water | 40 | 40 | 40 | 40 |
| | Existing HR capacity in water | 80 | 40 | 120 | 120 |
| | Sanitation | | | | |
| | Average number of ... | 1 | 1 | 1 | 1 |

| | | | | | |
|--|--|------------------------|-----------------------|----------------------|--------------------|
| | Total number of NGOs in sanitation | 15 | 15 | 15 | 15 |
| | Existing HR capacity in NGO sanitation | 11 | 11 | 15 | 15 |
| | PRIVATE SECTOR Water | | | | |
| | Average number of ... | 4 | 1 | 1 | 0.5 |
| | Total number of private sector organisations in water | 50 | 50 | 50 | 50 |
| | Existing HR capacity in private sector organisations in water | 175 | 50 | 50 | 25 |
| | Sanitation | | | | |
| | Average number of ... | 1 | 0 | 0.25 | 0.5 |
| | Total number of private sector organisations in sanitation | 20 | 20 | 20 | 20 |
| | Existing HR capacity in private sector organisations in sanitation | 10 | 5 | 5 | 10 |
| | PUBLIC SECTOR Water | | | | |
| | Average number of ... | 4 | 0 | 2 | 0.5 |
| | Total number of public sector organisations in water | 150 | 150 | 150 | 150 |
| | Existing HR capacity in public sector organisations in water | 525 | 38 | 300 | 75 |
| | Sanitation | | | | |
| | Average number of ... | 0 | 0 | | |
| | Total number of public sector organisations in sanitation | 8 | 8 | 7.5 | 7.5 |
| | Existing HR capacity in public sector organisations in sanitation | 0 | 0 | 0 | 0 |
| | | WATSAN technical field | Other technical field | Management & finance | Social development |
| | TOTAL NUMBER WORKING IN WATER | 780 | 128 | 470 | 220 |
| | TOTAL NUMBER WORKING IN SANITATION | 21 | 16 | 20 | 25 |

HR methodology: HR supply to the WASH sector

| 4.5 | TYPE OF TRAINING INSTITUTION | WATSAN technical field | Other technical field | Management & finance | Social development |
|-----|------------------------------|------------------------|-----------------------|----------------------|--------------------|
| | | | | | |

| | | | | |
|---|------|-----|-----|-----|
| University | 324 | 383 | 883 | 246 |
| Other higher education | 168 | 204 | 220 | 149 |
| Training institutes | 345 | 100 | 0 | 100 |
| Vocational training | 0 | 0 | 0 | 0 |
| Percentage going into the water sector | 70% | 1% | 5% | 10% |
| Percentage going into the sanitation sector | 2% | 1% | 1% | 1% |
| Total estimate of HR supply to WATER sector per year | 586 | 7 | 55 | 50 |
| Total estimate of HR supply in WATER sector to 2015 | 2930 | 34 | 276 | 248 |
| Trend up or down | | | | |
| Total estimate of HR supply to SANITATION sector per year | 17 | 7 | 11 | 5 |
| Total estimate of HR supply in SANITATION up to 2015 | 84 | 34 | 55 | 25 |

| HR methodology: HR shortages | | | | | |
|-------------------------------------|---|------------------------|-----------------------|----------------------|--------------------|
| | | WATSAN technical field | Other technical field | Management & finance | Social development |
| 4.6 | QUANTIFYING THE SHORTAGES | | | | |
| | WATER SECTOR | | | | |
| | HR shortage for achieving MDG | 3,864 | 596 | 3,799 | 669 |
| | HR shortage for achieving full service coverage | 6,701 | 879 | 5,500 | 1094 |
| | SANITATION SECTOR | | | | |
| | HR shortage for achieving MDGs | 637 | 444 | 419 | 2670 |
| | HR shortage for achieving full service coverage | 676 | 470 | 445 | 2813 |

Annex 6: List of Registered Engineers by Engineers Registration Board

A: Local Engineering Consulting Firms

| S/N o | Company Name | Reg. No. | Address | Tel Nos. Emails | Discipline/Area Of Specialization | Contact Person |
|-------|---|----------|---------------|--|--|---------------------------|
| 1 | K& Associates Professional Services Ltd | 001 | Box 14943 DSM | 2115639/0754666659 Amka-tz@maf.org | Civil | I .Kimambo |
| 2 | Metroconsult | 002 | Box 22669 DSM | 2618377,2618377, 0754284484 ally@raha.com | Civil and Structural Engineering | J. Rujweka |
| 3 | Tanconsult Ltd | 003 | Box 9411 DSM | 2760368 | Civil and Structural Engineering/Electrical Engineering/Mechanical Engineering | G. Ally J. Chuwa |
| 4 | Electriplan (T) Ltd | 004 | Box 23437 DSM | 2110529,0744781577 htemu@interafrika.com | Electrical Engineering/Mechanical Engineering | H. Temu E Lyamuya |
| 5 | J.G. Mcha & Associates | 005 | Box 10201 DSM | 2133766,0744377123 | Civil and Structural Engineering | J.Mcha |
| 6 | Crown Tech-Consult Ltd | 006 | Box 72877 DSM | 2181735,0741783213 | consulting engineers, surveyors, project managers | J. Kavishe |
| 7 | Jayant & Chohan Ltd | 007 | Box 4866 DSM | 2115693/75035 | Civil and Structural Engineering | J. Chohan |
| 8 | Serviceplan Ltd | 008 | Box 33165 DSM | 2700133,2772394 0754-395912 | Civil Engineering | B. Lyimo |
| 9 | Engg Consult | 009 | Box 31874 DSM | 0713-606500 | Civil and Structural Engineering | T Mfala |
| 10 | Ambicon Engineering Ltd | 010 | Box 7303 DSM | 2138244/2115868 | Civil Engineering ,Structural Engineering | N. Nyange J Lyatuu |
| 11 | Development Planning Consultants Ltd | 012 | Box 5884 DSM | 2120570/2126189 2153090/ mkl@mkonsult.net | Civil Engineering/Electrical Engineering/Mechanical Engineering | K. Sharma S. Sifuel |
| 12 | M-Konsult Ltd | 012 | Box 2711 DSM | 2151760,2151706 | Consulting Engineers | M. Meghji |
| 13 | EM-Consultants Ltd | 013 | Box 8665 DSM | 211811,2130986,0787 388844 | Civil Engineering/Electrical Engineering/Mechanical Engineering | M. Kamulali M. Munyagi |
| 14 | Projects Inter-design | 014 | Box 70844 | 0222183750,07542890 87 | Civil Engineering | J. Maganga |

| | | | | | | |
|----|---|-----|-----------------|---|--|----------------------------------|
| | | | DSM | interconsult@raha.com | | |
| 15 | Inter Consult Ltd | 015 | Box 423 DSM | 2772424/77 0754222013 | Civil /Structural ,Mechanical Electrical ,Engineering | M. Njiu S. Mosha |
| 16 | Lomo Consult | 016 | Box 21729 DSM | 2760131/44,07448968 10 | Civil Engineering ,Structural Engineering | Y. Lori |
| 17 | Mak Consult Engineering and Transport Services | 017 | Box 5104 DSM | 2123257/134673 | Civil Engineering | M. Nderingo M. Minja |
| 18 | Service Consult Ltd | 018 | Box 70153 DSM | 2150252,0741 325423 | Electrical Engineering | S. Shilla |
| 19 | National Estates and Designing Consultants Co. Ltd | 019 | Box 567 DSM | 2115075,2130577 | Civil | A.Mpunga S. Nkya |
| 20 | Co-Architecture | 020 | Box 4668 DSM | 2180170,2180121 Co-architecture@twiga.com | Civil Engineering ,Structural Engineering ,Architecture/Planning | A. Mwamakung e |
| 21 | Tanzania Industrial Studies & Consulting (TISCO) | 021 | Box 2650 DSM | 2131421/2,2132981/2 | Mechanical Engineering, Structural Engineering | F. Msaki T. Ruganyoisa |
| 22 | MMK Project Services Ltd | 022 | Box 593 DSM | 2150782/1 | Civil Engineering | M. Khalifani |
| 23 | Mbega & Associates Consulting Engineers & Town Planners Ltd | 023 | Box 10201 DSM | 2132457/111059/0713 624662 | civil eng. | M Mwengwa |
| 24 | Tangroup Ltd | 024 | Box 13502 DSM | tangroup@interafrica.com | civil engineering | |
| 25 | Ecosode Engineering and Consulting Co. Ltd | 026 | Box 31213 DSM | 2170946,0754 492384 | civil engineering | A. Mtui |
| 26 | Data Consult Ltd | 027 | Box 75439 DSM | 0754-383915 | civil engineering | F. Barozi |
| 27 | Design Partnership Ltd | 028 | Box 564 DSM | 2111346,2131392 dpl@cctz.com | civil engineering | S. Chavda Prof. A. Mawenya |
| 29 | R.H. Engineering Consultants | 030 | Box 294 DSM | 2183610,0754286380 | structural engineering | R. Holela |
| 30 | A.C.E. Consultants Ltd | 031 | Box 2718 Dodoma | 0784-664206, 026-2324128 | civil engineering | G. Chilewa |
| 31 | Tanzania Engineering and Manufacturing | 032 | Box 6111 Arusha | 027-2506220/8058 temdo@habari.co.tz | mechanical engineering | K. Koshuma |

| | Design Organization (TEMDO) | | | | | |
|----|--|-----|-----------------|--|--|-------------------------------|
| 32 | Technoconsult International Ltd | 033 | Box 1557 Arusha | 022-2113361 0713-327490 | mechanical engineering | J. Lyatuu |
| 33 | S & F Consultancy Limited | 034 | Box 13763 DSM | 2120677,2126415, 0784411405 | civil/ structural engineering | S. Njau |
| 34 | Bureau for Industrial Cooperation (BICO) | 035 | Box 35131 DSM | 2410113/4 | mechanical(eng), electrical (eng),structural (eng) | Dr. A. Kyaruzi |
| 35 | Saiffee Structural Engineering | 036 | Box 12082 DSM | 2127601 | civil (eng) | S. Muslim |
| 36 | AGRENEB Consult Ltd | 037 | Box 35168 DSM | 2774435/2701957 agreneb@ud.co.tz | electrical (eng) | R. Mboma |
| 37 | Pendharkar and Associates | 038 | Box 5104 DSM | 2123257 | civil (eng) | S. Pendharker |
| 38 | Don Consult Limited | 039 | Box 4218 DSM | 2700102,0784412132 donconsult@nyenzi.com | water supply. | L. Sechu |
| 39 | G.M.P. Consulting Engineers Limited | 041 | Box 425 Arusha | 0748524004,0278689 | civil (eng) | M. Leach |
| 40 | Chavda AlMohamedia Consultants Ltd | 043 | Box 444 DSM | 2152447,2150666 2152447 | civil (eng) | G, V.Chavda |
| 41 | MEL Consult Ltd | 044 | Box 72163 DSM | 0754263755 0754675757 | Civil/Structural | A. Mboma |
| 42 | Estate Care Tanzania Ltd | 045 | Box 8485 DSM | 0754-394928 | civil (eng) | I. Shali |
| 43 | CODEC | 047 | Box 5853 DSM | 0784-212285 | civil (eng) | A. Mwageni |
| 44 | Aeroproject Tanzania Ltd | 048 | Box 3146 DSM | 2150785 0754-268222 Aeropt2@interafrika.co | civil (eng) | P. Muganyizi |
| 45 | Sansutwa Simtali Ltd | 050 | Box 33060 DSM | 0744057195,2129363 | Civil | O. Mng'ongo |
| 46 | H-Consult Ltd | 051 | Box 5174 DSM | 0744 266641 hiza@africaonline.co.tz | Civil/Structural Engineering | C.Chiza |
| 47 | Wilalex Consults | 052 | Box 33032 DSM | 0784209878,0744302765 | Civil Engineering | W. Balongo |
| 48 | ENV – Consult (T) Ltd | 053 | Box 31318 DSM | 2772209/2774052 | Civil Engineering | Prof. T. Mbwette |
| 49 | MIÑO Consulting Engineers Ltd | 054 | Box 6550 Moshi | 0784-293299 0744689756 noel@tanga.net | Highway Engineering | G. Mwagosi |
| 50 | Engineering Research Associates Ltd | 055 | Box 31120 DSM | 2701508/9 trwba@udsm.ac.tz | Civil/Transportation Engineering | Prof. Rwebangira J. Kabyemera |

| | | | | | | |
|----|---|-----|---------------------|--|-------------------------------------|---------------------------|
| 51 | SOU Consult | 056 | Box 13752 DSM | 2461457/8,0713-406659,0754-965293 | Civil/Structural Engineering | Z. Oshudada S. Ntundye |
| 52 | Research and Consultancy Bureau – DIT | 057 | Box 2958 DSM | 2150174/2151395 rbc_dit2000@yahoo.com | Electrical Engineering | M. Kusekwa |
| 53 | Geocenta Limited | 058 | Box 6877 DSM | 0744472001 | Structural/Geotechnical Engineering | K. Mwemba |
| 54 | Applied Engineering & Byteworks (T) Ltd | 059 | Box 32736 DSM | 2668392,2773761/2 mdaebw@ttcl.co.tz | Telecommunications/ICT | Dr. Yonah |
| 55 | STRUCO Ltd | 060 | Box 5898 DSM | 2760633/37 | Civil & Structural | M. Madeleka |
| 56 | ITECO (T) Ltd | 061 | Box 544 Morogoro | 2122465,023 2604593 0713-777510 iteco@morogoro.net | Civil | Y. Seng'enge |
| 57 | NIMETA Consult (T) Ltd | 062 | Box 104943 DSM | 2183395,0754-386756 | Civil & Structural | E. Taseni |
| 58 | Nucleus Engineers | 063 | Box 19864 DSM | 0754-280514 nucleus@ud.co.tz | Civil & Structural | K. Byabato |
| 59 | Apex Engineering Co. Ltd | 064 | Box 4111 DSM | 2772374,0743329583 | Civil & Structural | R. Mushi |
| 60 | Msasu J Consultants ltd | 065 | Box 11962 DSM | 2630345,0784525665 | Electrical | |
| 61 | Nor-Consult (T) Ltd | 066 | Box 9620 DSM | 26677344/8399 ntz@norconsult.co.tz | Civil Engineering | F. kifukwe |
| 62 | BISH Tanzania Ltd | 067 | Box 1821 DSM | Bish4@afsat.com | Civil & Structural | Z. Kyando |
| 63 | EWAREMA Consult Ltd | 068 | Box 5592 DSM | 0713-337991 | Civil/Structural | L. Materu |
| 64 | F.B. Consult | 069 | Box 6389 DSM | 0748305538 bitesigile@yahoo.com | Civil/Structural | FF. Bitesigile |
| 65 | N + D Consult Ltd | 070 | Box 3097 DSM | 2774950 | Civil/Structural | A. Massawe |
| 66 | UCLAS Consultancy Unit | 072 | Box 35176 DSM | 2701404 hae@uclas.ac.tz | Environmental | M. Kasera |
| 67 | O & A Company Ltd | 071 | Box 79990 | 0748369134 oanda@oanda.net | Mechanical | M. Rweyemamu |

| | | | | | | |
|----|--|-----|-------------------|---|---|-------------------------|
| | | | DSM | | | |
| 68 | UNDI Company Ltd | 073 | Box 12615 DSM | 0754-300090 undi@max.com | Civil/Structural Mechanical | |
| 69 | Mandela Investments and Consulting Ltd | 074 | Box 79760 DSM | 0744392657 0745431228 msangihrs@hotmail.com | Civil/ Structural | Z. Msangi |
| 70 | Energy Management Associates Ltd | 075 | Box 4344 DSM | 0754-494853 0784-455880 | Mechanical, Electrical Electronics | E. Msunzu B. Msowoya |
| 71 | Tangroup Consults (T) Ltd | 076 | Box 72542 DSM | 0754-232357 tangroup@nyenzi.com | Civil/Structural | E. Ulimali |
| 72 | Taurian Communications (TZ) Ltd | 077 | Box 110008 DSM | 2119000 taurian@tauriancommunication.com | Telecommunications, Electronics | P. Muhumbira |
| 73 | Pan Design and Planning Consultancy | 078 | Box 3106 DSM | 0713670529 | Civil/Structural | D. Ruganuzza |
| 74 | SW Msambaza Design Consult | 079 | Box 78787 DSM | 0741278523 | Civil/Structural | S. Msambaza |
| 75 | POA Engineers PTE Ltd | 080 | Box 45140 DSM | Poaengineers@hotmail.com | Mechanical, Electrical | A. Mahuna |
| 76 | Nduta and Company Enterprises | 081 | Box 979 Mwanza | 0754-439811 ginnery@yahoo.com | Mechanical (Ginnery/Oil) | L. Nduta |
| 77 | Fabcast Technologies Co. Ltd | 082 | Box 34626 DSM | 2617497 owekisha@uccmail.co.tz | Mechanical | Dr. J. Runyiro |
| 78 | Hydro Works Technic Co. Ltd | 083 | Box 8831 DSM | 2112155 0748332234 hydro@hydrotz.com | Mechanical | N. Msimbira |
| 79 | FBNE Ltd | 084 | Box 78620 DSM | 2666974,0787161210 | Civil/Structural, Environ, Electrical | B. Muimbula |
| 80 | A.M. | 085 | Box 1973 | 0741265797 | Civil/Structural | A Mwinyi |

| | | | | | | |
|----|---|-----|---------------------|--|---|---------------------|
| | Consultants Structural Engineers | | Tanga | | | |
| 81 | Irriconsult and General Engineering Services | 086 | Box 228 Moshi | 0744273942 snowcap@aeltz.com | Civil/Irrigation | O. Simba |
| 82 | Tanzania Buildings Agency | 087 | Box 9542 DSM | 2135233,0754312040 mowbd@raha.com | Civil/Structural | J. Njau |
| 83 | Network for Water and Sanitation (T) Ltd | 088 | Box 54068 DSM | 2771614 | Civil, Water & Sanitation | Dr. L. Chamurilo |
| 84 | UWP Consulting Tanzania Ltd | 089 | Box 8151 DSM | 2780341,0784209155 Catma.h@uwp.co.tz | Civil | H.Catma |
| 85 | ML Engineering Consultancy | 090 | Box 70267 DSM | 0787 577954/0745 577954 | Electrical Engineering | M. Laswai |
| 86 | Q- Professional International Consultants Ltd | 091 | Box 235 DSM | 2861060/6 | Civil/Structural Engineering | S. Qadri |
| 87 | Norplan Tanzania Ltd | 092 | Box 2820 DSM | 2668090/6,2668340 admin@norplan.tz.org | Civil, Structural, Electrical, Geotechnical | E. Mushi |
| 88 | National Housing Corporation | 093 | Box 2977 DSM | 2851590, 0713427985 dq@nhctz.com | Civil/Structural | E. Kasango |
| 89 | Belva Consult Ltd | 094 | Box 75212 DSM | 2120447/0,2120448 0744270400 | Civil/Structural | J. Lukaza |
| 90 | Environmental Benchmark | 095 | Box 77222 DSM | 0754-353954 | Civil(Environmen tal) | V. Rwenyagira |
| 91 | Mastership (T) Consultants Ltd | 096 | Box 4710 DSM | 2862797,0744565455 jsndunguru@yahoo.co.uk | Mechanical Engineering | J. Ndunguru |
| 92 | Tanplanet Njegimi | 097 | Box 46032 | 2861818,0754311158 taneco_tan@yahoo.co | Civil(Irrigation) | A. Issac |

| | | | | | | |
|-----|------------------------------------|-----|-----------------|--|------------------------------|-----------------------------------|
| | Express Co. Ltd | | DSM | m | | |
| 93 | Logistics Engineering Ltd | 098 | Box 77283 DSM | 2666079 admin@log.co.tz | Civil, Mechanical | A. Mayers |
| 94 | MATconsult (T) Ltd | 099 | Box 1838 Arusha | 0272505048 matconsult2007@yahoo.com | Civil/Structural | R. Matolo |
| 95 | Galaxy Project Services Ltd | 100 | Box 32600 DSM | 0754265621 galaxyprojectservices@yahoo.com | Civil/Structural | H. Kitova R. Rajabu |
| 96 | M & M Tanzania Ltd | 101 | 31609 DSM | 0784409119 m_m@uccmail.co.tz | Civil | G. Mkusa |
| 97 | Kimphil Konsult (T) Ltd | 102 | 90060 DSM | 0713224445,2125356 | Mechanical | M. Kimaka |
| 98 | GOCH Consult Co. Ltd | 103 | 75414 DSM | 2124628,0754363119 | Civil/Structural | G. Matovelo |
| 99 | Multiwater Company Ltd | 104 | 70432 DSM | 2460301, 0732926547 | Civil/Water Resources | M. Katakweba |
| 100 | Cordial Solutions Ltd | 105 | 32442 DSM | 0754 280 580 | Civil/Structural | A. Byabato |
| 101 | Afri-Base Consultants Ltd | 106 | 34745 DSM | 0754 898 644 | Civil/Structural | V. Ndyamukama |
| 102 | BEZALEL + SAM Ltd | 107 | 16590 Arusha | 0732 975 600 bezalelengineers@hotmail.com | Civil/Structural | S. Makara |
| 103 | UNITEC Civil Consultants (Pty) Ltd | 108 | 33531 DSM | 0732 993 372 unitectz@gmail.com | Civil/Structural | C. Masambaji M. Besta |
| 104 | MEKON Consult | 109 | 34414 DSM | 0754 600 876 jsmshana@yahoo.com | Civil/Structural, Mechanical | Prof. J. Mshana Dr. Rubaratuka |
| 105 | NIB-PLAN Consult Ltd | 110 | 34773 DSM | 0732 926 166 | Civil/Structural | B. A. Silemu |
| 106 | Srat Consult | 111 | 6296 Mwanza | 028 2540922 | Civil/Structural | S. Twaakyondo |
| 107 | Paulsam Geo-Engineering | 112 | 70812 DSM | 022 2460948 sgwamaka@paulsam.com | Mining Engineering | S. Mafwenga P. Gonggo |

| | Co | | | co.tz | | |
|-----|--|-----|-----------|--|---------------------------------------|----------------------|
| 108 | Aqgola Engineering & Management Services Ltd | 113 | 3097 DSM | 2774950 | Civil/Structural | A. J. Massawe |
| 109 | MTL Consulting Company Ltd | 114 | 77894 DSM | 022 2120882 wmutagwaba@mtlconsulting-tz.com | Mining Engineering | Dr. W. Mutagwaba |
| 110 | Tanzania Electrical Mechanical & Electronics Services Agency | 115 | 70704 DSM | 022 2862796 ufundi@ud.co.tz | Electrical and Mechanical Engineering | M. Le-Kujan |
| 111 | DOCH Limited | 116 | 31871 DSM | 022 2461780 dochlimited@yahoo.com | Civil Engineering | P. C. Chuwa |
| 112 | MIST Consultancy Bureau | 117 | 131 Mbeya | 025 2502861 principal@mist.ac.tz | Civil Engineering | Prof. J. Msambichaka |
| 113 | Design Incorporated Ltd | 118 | 8255 DSM | 0777 694 940 faridakisha@engineer.com | Electrical Engineering | F. K. Mawenya |
| 114 | Anova Consult & Co. | 119 | 45696 DSM | 0715 007 019 | Civil/Structural | K. Kitero |
| 115 | Georiental Consultants Ltd | 120 | 32421 DSM | 0784 343 019 eddynyambo@yahoo.com | Civil Engineering | E. Nyambo |

22 Total Numbers Civil Engineering Water Local;

B: Foreign Engineering Consulting Firm

| S/ No | Company Name | Reg. No | Address | Tel Nos. Emails | Discipline/Area Of Specialization | Contact person |
|-------|---|---------|------------------|---|---|----------------|
| 1 | Norplan A.S. (T) Branch | 001 | Box 2820 DSM | 668090/667020 | Hydropower, Structural, Environment | E. Mushi |
| 2 | ITECO Engineering Ltd | 003 | Box 544 Morogoro | iteco@iteco.ch | Road & Bridge Engineering, Energy, Hydropower | E. Schelber |
| 3 | Howard Humphreys Tanzania Ltd | 004 | Box 2555 DSM | 2600545-7 | Civil, Structural, Mechanical Engineering, | D. Mugishagwe |
| 4 | COWI Tanzania Consulting Engineers & Planners | 007 | Box 1007 DSM | 2666161 cowi@twiga.com | Mechanical Engineering, Civil Engineering, Electrical Engineering | E. Kazimoto |

| | | | | | | |
|----|--|-----|-------------------|--|---|----------------|
| | Ltd | | | | | |
| 5 | WEGS Consultants Ltd | 009 | Box 6103 Arusha | 027 3914 | civil engineering | J. Duinmayers |
| 6 | H.P. Gauff Ingenieure GMBH & Co. – JBG | 010 | Box 4351 DSM | 2117292-93 | consulting engineering | J. Pfeffer |
| 8 | Ausenco International PTY Ltd | 016 | Box 22731 DSM | 028 2621814 Brisbane@ausenco.com.au | Mineral Processing | Z. Meka |
| 9 | C.LOTTI & Associati SpA | 017 | Box 971 Mwanza | 028-2501061 028-2571052 lotti@lottiassolati.com | Civil/ construction Supervision | J. Becket |
| 10 | DORSCH Consult | 018 | Box 363 Songea | 025-2602377 dc-muc@dorsch.de | Processing/Water Resources | Ducan campbell |
| 11 | GIBB Eastern Africa Ltd | 019 | Box 10522 DSM | 2130041 gibb@ud.co.tz | Transportation/Water/Sewerage/Environmental | Mbwambo |
| 12 | SMEC International PTY Ltd | 021 | Box 105866 DSM | 2601596 rmafrica@smec.co.is | Civil | Dr. Sabet |
| 13 | CES GmbH | 020 | Box 8060 Moshi | 027-2750193 info@ces.de | Civil, Water & Sanitation | M. Braasch |
| 14 | PARKMAN Ltd | 023 | Box 653 DSM | thewitt@twiga.com | Civil | S. Henderson |
| 15 | Tecslut International | 025 | Box 7303 DSM | 2138244 ambicon@udsm.com | Civil | P. Soleimani |
| 16 | Black & Veatch Consulting Ltd | 027 | Box 5104 DSM | 2123257 026-2502442 | Civil | R. Mitchell |
| 17 | Roughton & Partners International Ltd | 024 | Box 2892 Dodoma | 026-2321827 | Civil | M. Taylor |
| 18 | Japan Engineering | 022 | Box 10 Mtwambu | | Civil | Izawa |
| 19 | BKS Global Ltd | 026 | Box 8511 DSM | 2775110/12/13/14 | Civil | S.suleman |
| 20 | BCEOM | 028 | Box 6890 DSM | 2151760 | Civil | A. Mondolfo |
| 21 | Norconsult AS | 029 | Box 9620 DSM | 2667344 | Civil Engineering | P. Eather |
| 22 | Louis Berger AS | 033 | Box 6 Mwadui | 028-2762958 ibparis@louisberger.com | Civil Engineering | J. Jones |
| 23 | Dar Al Handasah | 030 | Box 80000 DSM | 2780833 Al-handasar@cats-net.com | Civil/Structural | A. Zouian |
| 24 | Hydroarch Srl | 032 | Box 645 Shinyanga | 026-2692920 secretary@hydroarchsr.com | Civil | R. Logiera |
| 25 | Poyry Environme | 031 | Box 256 Mbeya | 025-2500075 | Civil/Water | W. Machowetz |

| | | | | | | |
|----|--|-----|-------------------|--|------------------------------|--------------------|
| | nt GmbH | | | | | |
| 26 | STRATA Construction Management | 034 | Box 95673 Mombasa | +254 4147 2915 strata@africaonline.co.uk | Civil | R. Coppinger |
| 27 | Bergstan (T) Ltd | 035 | Box 31845 DSM | 2771840 bergstanz@bol.co.tz | Civil | G. Denton |
| 28 | UNETEC | 036 | Box 14580 DSM | 0787878585 (Rombo) info@unetec.org | Civil | Dawit Zemichael |
| 29 | Nils Bakke Ltd | 037 | Box 1321 DSM | 0754363333 | Civil | Nils Bakke |
| 30 | Essential Expertise Co. Ltd | 038 | Box 60578 DSM | 0784208698 | Electrical | Johannes Lottering |
| 31 | Lycopodium Tanzania Ltd | 039 | Box 22731 DSM | 2115225, 0737 040 084 | Civil Engineering | W. J. McDonald |
| 32 | Pegasus Management Company | 040 | Box 12675 Arusha | 027 2544389 Pegasus@habari.co.tz | Civil/Structural Engineering | J. Duinmayer |
| 33 | Runji & Partners Consulting Engineers Ltd | 041 | Box 423 DSM | 2772422 info@runji.co.ke | Civil Engineering | R. Ngware |
| 34 | Nicholas O'Dwyer & Co Ltd | 042 | Box 6218 Mbeya | 025 2504421 international@nicholasodwyer.com | Civil Engineering | C. Clere |
| 35 | Knight Piesold Pty Ltd | 043 | Box 23153 DSM | mschlagintweit@knightpiesold.com | Geological Engineering | M. Schlagintweit |
| 36 | ESB International Engineering & Facility Management | 044 | Box 105810 DSM | 0754 764 289 www.esbi.ie | Electrical Engineering | J. Ashley |
| 37 | Seureca Consulting Engineers | 045 | Box 54068 DSM | 022 2771614 | Water Resources Engineering | B. Bennett |
| 38 | Intercontinental Consultants and technocrats Pvt Ltd | 046 | Box 75439 DSM | 0783 100 219 tanzania@ictonline.com | Civil Engineering | P. Kapila |
| 39 | Engineering Systems Group (KSCC) Ltd | 047 | Box 2711 DSM | 0757 445 816 linovald@yahoo.com | Civil Engineering | R. Pearce |

The following is a list of the WSSAs in the Country falling under the Category of Public Utilities.

Component 1 Utilities

| SN | Region | Regional Town WSSA |
|----|---------|--------------------|
| 1 | Mara | Musoma |
| 2 | Kagera | Bukoba |
| 3 | Kigoma | Kigoma |
| 4 | Rukwa | Sumbawanga |
| 5 | Manyara | Babati |
| 6 | Lindi | Lindi, |
| 7 | Mtwara | Mtwara |

Component 2 Utilities

| S N | Region | Regional Town | District | WSSAs |
|--------|-------------|------------------|------------|---------------|
| 1 | Arusha | Arusha | Monduli | Monduli Mjini |
| 2 | | | Karatu | Karatu |
| 3 | Dodoma | Dodoma | Chamwino | Chamwino |
| 4 | | | Mpwapwa | Mpwapwa |
| 5 | | | Kongwa | Kongwa |
| 6 | | | Kondoa | Kondoa |
| 7 | Iringa | Iringa | Njombe | Njombe |
| 8 | | | | Wanging'ombe |
| 9 | | | Mafinga | Mafinga |
| 10 | | | Makete | Makete |
| 11 | | | Ludewa | Ludewa |
| 12 | | | Njombe | Makambako |
| 13 | | | Kilolo | Ilula |
| 14 | Kilimanjaro | | Same | Same |
| 15 | | | Mwanga | Mwanga |
| 16 | Kagera | Bukoba | Ngara | Ngara |
| 17 | | | Karagwe | Karagwe |
| 18 | | | Muleba | Muleba |
| 19 | | | Biharamulo | Biharamulo |
| 20 | Kigoma | Kigoma | Kibondo | Kibondo |
| 21 | | | Kasulu | Kasulu |
| 22 | Lindi | Lindi | Ruangwa | Ruangwa |

| S N | Region | Regional Town | District | WSSAs |
|----------------|---------------|--------------------------|-----------------|-------------------------|
| 2 | | | | |
| 2 3 | | | Kilwa Masoko | Kilwa Masoko |
| 2 4 | | | Nachingwea | Nachingwea |
| 2 5 | | | Liwale | Liwale |
| 2 6 | Manyara | Babati | Hanang' | Katesh |
| 2 7 | | | Mbulu | Mbulu |
| 2 8 | | | Babati | Magugu |
| 2 9 | Mara | Musoma | Bunda | Bunda |
| 3 0 | | | Serengeti | Mugumu |
| 3 1 | | | Tarime | Tarime |
| 3 2 | | | Musoma | Mugango/Kiabakari NP |
| 3 3 | Mbeya | Mbeya | Mbozi | Tunduma |
| 3 4 | | | Mbozi | Vwawa |
| 3 5 | | | Chunya | Chunya |
| 3 6 | | | Kyela | Kasumulu |
| 3 7 | | | Kyela | Kyela |
| 3 8 | | | Mbeya | Mbalizi |
| 3 9 | | | Ileje | Itumba |
| 4 0 | | | Rungwe | Tukuyu |
| 4 1 | Mtwara | Mtwara | Mtwara | Makonde NP |
| 4 2 | | | Masasi | Masasi |
| 4 3 | Mwanza | Mwanza | Magu | Magu |
| 4 4 | | | Misungwi | Misungwi |
| 4 5 | | | Ngudu | Ngudu |
| 4 6 | | | Sengerema | Sengerema |
| 4 7 | | | Geita | Geita |

| S N | Region | Regional Town | District | WSSAs |
|----------------|---------------|--------------------------|-----------------|--------------------|
| 4 8 | Rukwa | Sumbawanga | Mpanda | Mpanda |
| 4 9 | | | Nkasi | Namanyere |
| 5 0 | Ruvuma | Songea | Mbinga | Mbinga |
| 5 1 | | | Tunduru | Tunduru |
| 5 2 | Shinyanga | Shinyanga | Maswa | Maswa |
| 5 3 | | | Kahama | Kahama |
| 5 4 | | | Meatu | Mwanhuzi |
| 5 5 | | | Bariadi | Bariadi |
| 5 6 | Singida | Singida | Kiomboi | Kiomboi |
| 5 7 | | | Manyoni | Manyoni |
| 5 8 | Tabora | Tabora | Sikonge | Sikonge |
| 5 9 | | | Urambo | Urambo |
| 6 0 | | | Nzega | Nzega |
| 6 1 | | | Igunga | Igunga |
| 6 2 | Tanga | | Handeni | Handeni Trunk Main |

Component 3 Utilities:

| SN | Region | Regional Town | District | WSSAs |
|-----------|-----------------|--------------------------|-----------------|-------------------|
| 1 | Iringa | Iringa | Kilolo | Kilolo |
| 2 | Kilimanjaro | Moshi | Rombo | Kiliwater Company |
| 3 | Manyara | Babati | Kiteto | Kibaya |
| 4 | | | Babati | Galapo |
| 5 | | | Babati | Bashnet |
| 6 | Mbeya | Mbeya | Mbarali | Rujewa |
| 7 | | | Mbozi | Mlowo |
| 8 | Mwanza | Mwanza | Ukerewe | Nansio |
| 9 | Pwani Coast) | Kibaha | Rufiji | Utete |
| 10 | | | Bagamoyo | Chalinze |

| SN | Region | Regional Town | District | WSSAs |
|-----------|---------------|----------------------|-----------------|--------------|
| 11 | | | Mkuranga | Mkuranga |
| 12 | | | Kisarawe | Kisarawe |
| 13 | Rukwa | Sumbawanga | Sumbawanga | Chala Town |
| 14 | Ruvuma | Songea | Namtumbo | Namtumbo |
| 15 | Shinyanga | Shinyanga | Kahama | Kashwasa |
| 16 | | | Bukombe | Ushirombo |
| 17 | | | Maswa | Malampaka |
| 18 | | | Kishapu | Mhunze |
| 19 | | | Kishapu | Lalago |
| 20 | | | Kishapu | Kishapu |
| 21 | | | Kahama | Isaka |

Annex 7: Present strength, actual requirements and shortfall in human specialist technical capacity in the Central Government institutions

| Institutions | Graduate professionals | | | | | | | | | | | | | FTC and Diploma holders | | | | | | | | | | | |
|---|------------------------|------------|------------|----------|---------------|-------------------|-------------|-----------------|---------------|--------|-----------|----------|----------|-------------------------|----------------|------------|------------|-----------|--------------|-------|--|--|--|--|--|
| | Civil Engineer | Mechanical | Electrical | Electro- | Environmental | Drilling Engineer | Hydrologist | Hydro geologist | Water Chemist | Lawyer | Economist | Computer | Quantity | Sanitary | Civil Engineer | Mechanical | Electrical | Hydrology | Hydrogeology | Water | | | | | |
| Department of Water Resources (MOWLD) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Present Status | | | | | | | 35 | 28 | - | - | | | | | | | | 17 | 9 | | | | | | |
| Actual requirement | 2 | | | | 2 | | 40 | 40 | 2 | 2 | | | | | | | | 10 | 4 | | | | | | |
| Shortfall | | | | | | | 5 | 12 | 2 | 2 | | | | | | | | 0 | 8 | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Department of Rural Water Supply (MOWLD) | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------|--------|--------|---|--------|--|--|---|--|---|---|--|--|--|--|--|--|--|--|---------|--------|---|---|--|--|--|--|--|---|---|--|--|--|--|--|--|--|-----|--|--|
| Present Status | 3 7 | 1 9 | 1 8 | - | | | | | | - | - | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| Actual requirement | 4 6 | 4 5 | 4 5 | 2 | 1 | | | | | 1 | 1 | | | | | | | | | 6 | 7 | | | | | | | | | | | | | | | | | | | |
| Shortfall | 9 | 2 6 | 2 7 | 2 | 1 | | | | | 1 | 1 | | | | | | | | | 6 | 6 | | | | | | | | | | | | | | | | | | | |
| Department of Urban Water Supply and Sewarage (MOWLD) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Present Status | 3 8 | 9 | 4 | | 1 2 | | | 2 | | | | | | | | | | | | 12 8 | 1 3 | 7 | 3 | | | | | | | 7 | | | | | | | | | | |
| Actual requirement | 4 2 | 1 1 | 7 | | 2 4 | | | 2 | | | | | | | | | | | | 12 8 | 1 3 | 7 | 3 | | | | | | 7 | | | | | | | | | | | |
| Shortfall | 4 | 2 | 3 | | 1 2 | | | 0 | | | | | | | | | | | | 0 | 0 | 0 | 0 | | | | | | 0 | | | | | | | | | | | |
| Water Laboratories Unit (MOWLD) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Present Status | | | | | 4 | | | | | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 76 | | |
| Actual requirement | | | | | 5 | | | | | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 108 | | |
| Shortfall | | | | | 1 | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 32 | | |

| | | | | | | | | | | | | | | | | | | | | |
|--|--------|---|--|--|---|---|--|--|--|---|---|--|--|--|--|--|--|--|--|--|
| Ministry of Agriculture and Food Security | | | | | | | | | | | | | | | | | | | | |
| Present Status | 2 8 | 2 | | | 1 | 3 | | | | 2 | 0 | | | | | | | | | |
| Actual requirement | | 5 | | | 5 | 5 | | | | 2 | 5 | | | | | | | | | |
| Shortfall | | 3 | | | 4 | 2 | | | | 0 | 5 | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| Ministry of Energy and Minerals | | | | | | | | | | | | | | | | | | | | |
| Present Status | | | | | | | | | | | | | | | | | | | | |
| Actual requirement | | | | | | | | | | | | | | | | | | | | |
| Shortfall | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| Vice-President's Office | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|--|--|--|---|--|--|--|--|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|
| (Environment Division) | | | | | | | | | | | | | | | | | | | | | | | |
| Present Status | | | | 4 | | | | | 1 | 1 | 1 | | | | | | | | | | | | |
| Actual requirement | | | | 7 | | | | | 2 | 1 | 1 | | | | | | | | | | | | |
| Shortfall | | | | 3 | | | | | 1 | 0 | 0 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

Source: Ministry of Water (2005)

Annex 8: RECOMMENDATIONS ON THE MINIMUM NUMBER OF WORKERS AND CATEGORIES NEEDED FOR OFFICE OF DISTRICT WATER ENGINEER

(Planning and Design Section Personnel)

| | | |
|--|---------------|----------|
| - Water Resources Engineer | Engineer 1 | 1 |
| - Water Technician (FTC) | Technician 1 | 2 |
| - Water Technician (FTC) with IT Knowledge | Technician 1 | 1 |
| - Surveyor Technician (FTC/WRI trade test) | Technician II | 1 |
| - Drafting Technician (FTC/WRI trade test) | Technician II | 1 |
| - IT Operators (FTC/WRI trade test) | Technician II | 1 |
| Total | | 7 |

(Construction Section Personnel)

| | | |
|--|-------------------|-----------|
| - Water Resources Engineer | Engineer 1 | 1 |
| - Community Dev. Off. (Stashahada) | Com. Dev. Officer | 1 |
| - Environmental Engineer | | 1 |
| - Water Technician (FTC) | Technician I | 2 |
| - HG Surveyor Technician (FTC) | Technician I | 1 |
| - Plumber Technician (FTC/WRI Trade test) | Technician II | 1 |
| - Pump Mech. Technician (FTC/WRI trade test) | Technician II | 1 |
| - Masonry Technician (FTC/WRI trade test) | Technician II | 1 |
| - Hand pump Technician (trade test) | Technician II | 1 |
| Total | | 10 |

(Operation and Maintenance Personnel)

| | | |
|---|---------------|-----------|
| - Civil/Mechanical/Electrical Engineer | Engineer I | 1 |
| - Water Technician (FTC) | Technician I | 1 |
| - Mechanical Technician (FTC) | Technician I | 1 |
| - Electrical Technician (FTC) | Technician I | 1 |
| - Lab Technician (FTC) | Technician I | 1 |
| - Plumber Technician (trade test) | Technician II | 1 |
| - Pump Mech. Technician (trade test) | Technician II | 1 |
| - Electrical Technician (trade test) | Technician II | 1 |
| - Auto electrical Technician (trade test) | Technician II | 1 |
| - Welder Technician (Trade test) | Technician II | 1 |
| Total | | 10 |

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