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**NEPAD Southern African Water Centres of Excellence**

EU JRC Contract Number: 386793

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**Deliverable 1a**

**Report on task JLP1.1 and JLP1.2**

**Document prepared by:**

NEPAD SANWATCE Secretariat, SANWATCE members with

Stellenbosch University – Task leader

Date: April 2012

# List of Acronyms

CSIR Council for Scientific and Industrial Research

CDW Community Development Workers

DISS Department of Infrastructure and Support Service

DoL Department of Labour

DTF Devolution Trust Fund

DWAF Department of Water Affairs

ECSA Engineering Council of South Africa

EU JRC European Joint Research Commission

EHO Environmental Health Officer

EHP Environmental Health Practitioner

EWSETA Energy Water Sector Education Training Authority

FET Further Education and Training

GET General Education and Training

GWP-SA Global Water Programme-South Africa

H&H Health and Hygiene

HET Higher Education and Training

IWRM Integrated Water Resources Management

LFS Labour Force Survey

LGSETA Local Governance Sector Education Training Authority

MLGH Ministry of Local Government and Housing

NEPAD SANWATCE NEPAD Water Centres of Excellence-

Southern African Water Centres of Excellence

NISIR National Institute of Scientific and Industrial Research

NQF National Qualification Framework

RISDP Regional Indicative Strategic Development Plan

RWP Regional Water Plan

RWS Regional Water Strategy

RWSS Rural Water Supply and Sanitation

SADC Southern African Development Community

SADC RSAP Southern African Development Community Regional Strategic Action Plan

SAICE South African Institute of Civil Engineers

UB University of Botswana

UEM University of Eduardo Montlane

UNESCO United Nations Educational, Scientific and Cultural Organization

US University of Stellenbosch

UWC University of Western Cape

UNZA University of Zambia

WASH Water Sanitation and Hygiene

WRC Water Research Commission

WRM Water Research Management

WRRU Water Resources Research Unit

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# EXECUTIVE SUMMARY

SADC is a region with complex patterns and striking paradoxes of climate, geography, economic, social, cultural and political features. The countries of the SADC region are at different levels of development. Given this reality, it would neither be possible nor desirable to recommend a single national water development strategy. What is lacking is a collaboration effort within the Region where countries develop their own new approaches and strategies suited to their specific country conditions, given the differences in climate, geography, economic, social, cultural and political differences. At the projected population growth and economic development rates, water will increasingly become the limiting resource and supply will become a major restriction to the future socio-economic development of each SADC country in terms of both the amount of water available and the quality of what is available. This will require specific targeted skills to manage the complexity of the water sector in the Region.

In order to deliver on the Millennium Development Goals it is a basic requirement that a country has the necessary skills base. In view of this a number of studies have been done in recent years to determine the skills gaps so that the necessary interventions can be made. From these studies it is evident that the water sector in Southern African Development Community (SADC) faces gaps and shortages in certain skill areas. The main findings of these are summarized in the attached appendices and will be referred to later in this document.

This study was conducted based on the objectives as laid out by the EC JRC. These are as follows:

• JLP 1.1 Survey on requirements in higher education and within training for practitioners in the water sector.

• JLP 1.2 A study on how the Centres of Excellence could better address sector expertise consultancy and advocacy needed for sector development in the region.

The project was undertaken in 2 Phases:

Phase 1 – an initial survey-questionnaire consisting of water experts in the SADC region and complimented by research outputs of SADC countries, followed by and;

Phase 2 – extending the survey-questionnaire to network communities in the SADC region and complimented by an internet assessment of water-related vacancies in the SADC region in prominent private- and public institutions.

More specifically the following methodology was followed:

**Phase 1:**

• The assessment of the skills shortages was conducted using an electronic survey as a pilot project in the SANWATCE member countries (i.e. South Africa, Zambia, Botswana, Mozambique and Malawi).

• A further skills assessment was done using an electronic database (SCOPUS) of research outputs in all of the SADC countries

• Universities, colleges and training centres from the SADC region were researched to determine the educational offering in the water sector.

• Existing studies of skills shortages and gaps were used as baseline data from recent relevant studies.

**Phase 2:**

* The assessment of the skills shortages was conducted using an electronic survey which was circulated to the following network-communities:
  + Institute of Municipal Engineers of South Africa (IMESA) (approximately 280 members);
  + International Water Association – East and Southern African Region (IWA-ESAR);
  + Water Operators’ Partnership (WOP);
  + Water Institute of South Africa (WISA)[[1]](#footnote-1) (approximately 2500 members);
  + African Water Association (AfWA);
  + EU JRC to Aquaknow.net members;
  + Aquaknow.net members in the “NEPAD Southern African Network” group (approximately 45 members);
  + Consortium members in the NEPAD SANWATCE
  + Through SADC Water to 22 water experts in the SADC Region (Mr. Phera Ramoeli)
  + African Ministers Council on Water Secretariat (AMCOW) – Mr. Baai-Mas Taal
  + UNESCO IHE – Dr. Stefan Uhlenbrook
  + Various individuals in the SADC Region
* A further skills assessment was done by completing an online search at the vacancy web-portal careerjet.co.za on water-related vacancies in the 15 SADC countries.
* Individual vacancy searches were also conducted at the prominent water-sector employers in South Africa by accessing the websites of RandWater; South African Department of Water Affairs (DWAF); Arcus Gibb; SASOL and ESKOM.

**From the study it was concluded that:**

**Training Needs:**

* The majority of the skills are in higher education and research institutions.
* In Phase 1 of the study, limited skills in the areas of Conflict Mediation; Environmental Law; Marketing; Occupational; Climatology; Forestry; Waste Management; Chemical Engineering; Construction; Coastal Engineering; Plant maintenance/operations; Artisans; Agronomy (irrigation, soil sciences) and Ecology were identified. This might be because many of the respondents were from research and higher education institutions and therefore does not suggest that these skills are absent in the region. In Phase 2 of the study, institutions from such areas were contacted through network-associations, but with limited success.
* Most water-sector vacancies are within South Africa (93%), followed by Angola; Zambia and Democratic Republic of Congo (DRC). During this study, relatively few water-sector vacancies were found for the other SADC-countries.
* This study concluded that the top water-sector vacancies in the SADC-Region is for Water and Sanitation Scientist/Engineer/Area Managers; Civil Engineers; Hydraulics/Water Resources Engineers; Water Treatment Specialists; Senior Management (with technical background); Project Managers; Sales Technologist/ Rep/ Account Manager (Water Treatment); Process Control Engineers; Human Resources; Electricians; Water and Waste Water Engineers; Social Scientists; Water Systems/Pipeline Engineers; Environmental Project Manager; Managers (Water Treatment); Process Design Engineers; Hydro-graphic Surveyors; Fitter and Turners and Irrigation/Drainage Engineers
* The top water-sector vacacies in South Africa is for Water and Sanitation Scientist/Engineer / Area Managers; Civil Engineers; Water Treatment Specialists; Hydraulics/Water Resources Engineer; Senior Management (with technical background); Project Managers; Sales Technologist/ Rep/ Account Manager (Water Treatment); Process Control Engineers; Human Resources; Electricians; Water and Waste Water Engineers; Social Scientists; Water Systems/Pipeline Engineers; Environmental Project Managers; Hydro-graphic Surveyors; Fitter and Turners; Irrigation/Drainage Engineers; Chemical Engineers and Water Resource Management Specialists.

• Many organizations support training provided within formal education structures such as Further Education Training; capacity building strategies; mentorships and Higher Education Training and support the different types of training being used.

• Most organizations prefer that skill development be undertaken at formal and accredited training institutions such as Higher Education and training HET institutions.

• Various training institutions exist within particularly South Africa, and various institutions offer water-related training such as WaterNet; Capnet; IWEGA; UNESCO-IHE and GWP-SA.

• Further, there are at least HET in each SADC country, but is unclear in which areas they specialise in, and should be investigated further in order to breach skills gaps and requirements.

* In South Africa various scares skills were identified which included Process Controllers; Artisans; Water and Waste Treatment Process Operations – NQF 2; Information technology communications officers; Plumbing, welding ,electrical; Engineers; Project Managers; Surveyors and architectures; Analytical Biochemistry, microbiologist; Scientists and Occupational Health and Safety Training practitioners.
* The South African department of Water Affairs and further indicated that approximately 3,000 Civil Engineers; 7,200 Health and Hygiene Practitioners; 23,000 Managers and 4,000 artisans and technicians are required.
* In Zambia, approximately 760 water professionals are required between the public sector/ parastatals; District and Municipal Councils; Commercial Utilities and Private Sector.
* In Botswana a wide range of professionals; technicians and artisans are required in order to meet the staff requirements of the Botswana government. The staff include Hydrologists; Groundwater Modellers; Civil Engineers; Electrical and Mechanical Engineers; Electrical and Mechanical Technicians; Customer Relations Officers; Financial Officers; Water Engineers; HRD (either in-house or corporate function); Pollution Control Officers; Conservation Officers; Public Education Officers; ICT Technical Officers; Human Resource Planning; Hydrogeological Modeller; Project Management Professionals; Supervision and Leadership Professionals; Public Relations Skills Professionals; Staff Supervision Technicians; Basic Survey and Design Technicians.
* Based on information from a SADC wide study undertaken for SADC, training needs were identified for:
  + Decision makers – Basic and non-technical courses which should not be more than 3 days through regional bodies such as GWP who has experience in dealing with decision makers.
  + Professionals already working in the sector – specialised training focussed on water accounts they need to compile. These professionals include hydrologists, hydro-geologists, statisticians, environmentalists, economists and planners. Course should also not take more than 7 days.
  + Career Seekers in Economic accounting of water- targeted at students who are interested in the water sector at undergraduate and post-graduate levels. Various institutions exist throughout SADC who can offer such courses.
* Data regarding the exact numbers of skilled people for the other countries are not known.

**Research Needs:**

• Based on research outputs by Higher Education Institutions in the sector a major gap was identified between South Africa and other SADC countries in terms of research capacity.

• A need exist for research in South Africa within the areas of Irrigation; Potable water/health; Climate change; Monitoring; Water Law; Eutrophication; Groundwater; Energy; Erosion; Infrastructure; Floods and Sanitation in order to bridge the skills gaps • Major gaps in crucial areas e.g. water law, ground water, eutrophication, energy, floods, erosion, infrastructure, sanitation, floods, and governance. Again the lack of research in these areas reflects in practice, the major challenges in terms of water management. It would hence be very difficult for these countries to make decisions that are evidence based, leading to the many problems with water management in the region. This results in the lack of infrastructure development a concomitant lack of water supply and sanitation etc.

• A need exists for research in Tanzania within the areas of Economic development; Modelling; IWRM; Irrigation; Waste water; Eutrophication; Energy; monitoring; Ground water; Floods; Sanitations; Estuary; Erosion and Infrastructure in order to bridge the skills gaps which exist in Tanzania.

• A need exists for research in Zimbabwe within the areas of Ecology; Modelling; Water law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure in order to bridge the skills gaps which exist in Zimbabwe.

• A need exists for water related research in Botswana within the areas of Ground water; Irrigation; Floods; Potable water; Economic development; IWRM; Water Law; Waste water; Eutrophication; Energy; Sanitation; Estuary; Erosion; Infrastructure in order to bridge the skills gaps which exist in Botswana.

• A need exists for research in Malawi within the areas of Ecology; Modelling; Water Law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure in order to bridge the skills gaps which exist in Malawi.

**Recommendations**

* Since other studies are also undertaken, and specifically in South Africa to determine the educational gaps in the water-sector, collaboration should be established with the Water Institute of South Africa, to exchange and compare results of the various studies.
* Since research outputs by Higher Education institutions are an indication of knowledge within a specific topic-area, such research driven capacity building should become a major focus of future investment in SADC in order to address the major backlog in terms of water-sector research output in the relevant priority areas for specific countries. These can be determined through consultation at a high governmental level and further be identified using a more search criteria using software programmes like SciVal Spotlight and SciVal Expert[[2]](#footnote-2).
* Private- and public institutions provide the employment opportunities for individuals within the water-sector. Training institutions (such as Higher Education and Training institutions; Accredited Service Providers and Further Education and Training institutions) should align their educational offering to meet this need.
* As indicated earlier, training institutions (such as Higher Education and Training institutions; Accredited Service Providers and Further Education and Training institutions) should align their educational offering to meet the need of industry
* Funding should also be made available for supporting scholars to attend the appropriate courses that are already available in the SADC region.
* It is evident that artisans; technicians and professionals are required in order to meet the needs of the water-sector in SADC. Some data are available for specific SADC countries such as South Africa, Zambia and Botswana, and further over-view requirements are provided for the SADC-region. For other SADC countries the data might not be available, and in an absence of such data, other research data should be used as indicators. Such data include the quantitative studies undertaken in this study.

# INTRODUCTION

SADC is a region with complex patterns and striking paradoxes of climate, geography, economic, social, cultural and political features. The countries of the SADC region are at different levels of development. Given this reality, it would neither be possible nor desirable to recommend a single national water development strategy. What is lacking is a national effort within the Region where countries develop their own new approaches and strategies suited to their specific country conditions - given the differences in climate, geography, economic, social, cultural and political differences. At the projected population growth and economic development rates, water will increasingly become the limiting resource and supply will become a major restriction to the future socio-economic development of each SADC country in terms of both the amount of water available and the quality of what is available. This will require specific targeted skills to manage the complexity of the water sector in the Region.

In order to deliver on the Millennium Development Goals it is a basic requirement that a country has the necessary skills base. In view of this a number of studies have been done in recent years to determine the skills gaps so that the necessary interventions can be made. These studies include:

* A Coordinated Approach to the Water Sector Skills Crisis” – South African Department of Water and Environmental Affairs (2007)((WSLG), 2010)
* Energy and Water Services Sector (EWSETA). Sector skills plan 2011-2016 Review Update.
* Botswana Ministry of Minerals, Energy and Water Resources Affairs, D. O. W (2006). Government of Botswana - National Water Master Plan Review (Volume 10). Gaborone, Botswana.
* Department of Water Affairs and Forestry (DWAF), 2009. A Coordinated Approach to the Water Sector Skills Crisis.
* Energy & Water Services Sector (EWSETA)(2011). Sector Skills Plan 2011 – 2016. Review Update.
* Global Water Challenge (2011). Regional WASH Profile on AFRICA. http://www.globalwaterchallenge.org/home/ (15 February 2012).
* Hochman, G. and Mahasha, M.” Skills shortages in the water sector” in The Mvula Trust (2009)
* Matete, D. M (2010). “SADC Training Needs Assessment Report Final” in Economic Accounting water uses project (2010).
* Stoltz, H., Jørgensen, M., Mutale, M., Zulu, A., Sipuma, R., & Lumba, W. K (2007). Government of the Republic of Zambia; “Ministry of Local Government and Housing: Sector Capacity Study Water and Sanitation”, Lusaka

From these studies it is evident that the water sector in Southern African Development Community (SADC) faces gaps and shortages in certain skill areas. The main findings of these are summarized in the attached appendices and will be referred to later in this document.

The SANWATCE network was contracted by the JRC to further do an independent investigation into the skills shortages that exist in the SADC region, and to further discuss how the Centres of Excellence could better address sector expertise and advocacy for sector development in the region.

# OBJECTIVES

This study was conducted based on the objectives as laid out by the EU JRC. These are as follows:

**JLP 1.1 *Survey on requirements in higher education and within training for practitioners in the water sector.***

The main information required are the number of professionals needed in the region by the sector (private, public, academia, NGO etc.) and the specific qualification required. This task will be carried out in all the countries represented by the members of the NEPAD SANWATCE network (JRC).

**JLP 1.2. *A study on how the Centres of Excellence could better address sector expertise consultancy and advocacy needed for sector development in the region.***

“This study will identify the needs in the Water Sector (including the different stakeholders in the region: private, public, academia, NGO etc.) for advocacy and consultancy which currently are not met or met through expertise external to the region” (JRC).

# RESEARCH METHODOLOGY

**Phase 1**

In order to better understand what water-sector skills gaps exist in the SADC-Region, a review of existing studies were undertaken. Studies and results that are readily available were requested from the parties who undertook the studies, and where available, reports were accessed from the internet. The results thus provided baseline data for this project and thus used as secondary data, detail of studies are provided below in table 1.

In order to determine the effectiveness of the survey questionnaire, the assessment of the skills shortages was conducted using an electronic survey as a pilot project in the current SANWATCE member countries (i.e. South Africa, Zambia, Botswana, Mozambique and Malawi). During the first phase of the study, the assessment of the skills shortages was conducted using an electronic survey. The survey was piloted to do a small experiment and to test logistics prior to a larger study and to improve the quality of the questionnaire. The pilot questionnaire was emailed to the SANWATCE members and was amended accordingly.

After the pilot study among the SANWATCE members, the survey was emailed to experts working in the water sector of SADC to complete the questionnaire.

* A further skills assessment was done using an electronic database (SCOPUS) of research outputs in all of the SADC countries.
* Universities, colleges and training centres from the SADC region were researched to determine the educational offering in the water sector.

**Phase 2:**

As a follow-up from March 2012 to April 2012, an updated survey was designed to capture both qualitative and quantitative data. The data from the survey was analysed at country level and then compared with the results of the other countries in order to get to a regional overview. The survey was circulated to the following institutions and networks which would represent the SADC-Region:

* Institute of Municipal Engineers of South Africa (IMESA);
* International Water Association – East and Southern African Region (IWA-ESAR);
* Water Operators’ Partnership (WOP);
* Water Institute of South Africa (WISA)[[3]](#footnote-3);
* African Water Association (AfWA);
* EU JRC to Aquaknow.net members;
* Aquaknow.net members in the “NEPAD Southern African Network” group;
* Consortium members in the NEPAD SANWATCE
* Through SADC Water to 22 water experts in the SADC Region (Mr. Phera Ramoeli)
* African Ministers Council on Water Secretariat (AMCOW) – Mr. Baai-Mas Taal
* UNESCO IHE – Dr. Stefan Uhlenbrook
* Various individuals in the SADC Region

An desktop-internet survey was also conducted on water-related vacancies available in the SADC countries, and further of the major water-sector employers (private- and public institutions) in South African being RandWater; South African Department of Water Affairs (DWAF); Arcus Gibb; SASOL; and ESKOM. In order to make the data as relevant as possible, only vacancies as advertised from 1 January 2012 were used.

Table 1: Research methodology for JLP 1.1

|  |  |
| --- | --- |
| **JLP 1.1** | |
| **Qualitative study** | |
| **PHASE 1:** |  |
| Step 1. | Existing studies of skills shortages and gaps were used as baseline data. The following skills audits and data were used:   * Botswana Ministry of Minerals, Energy and Water Resources Affairs, D. O. W. (2006). *Government of Botswana - National Water Master Plan Review (Volume 10)*. Gaborone, Botswana. * Department of Water Affairs and Forestry (DWAF), 2009. *A Coordinated Approach to the Water Sector Skills Crisis.* * Energy & Water Services Sector (EWSETA). (2011). *Sector Skills Plan 2011 – 2016. Review Update*. * Global Water Challenge, 2011. *Regional WASH Profile on AFRICA*. http://www.globalwaterchallenge.org/home/ (15 February 2012). * Hochman, G. and Mahasha, M.” Skills shortages in the water sector” in *The Mvula Trust*, 2009:1-2 * Matete, D. M, 2010. “SADC Training Needs Assessment Report Final” in *Economic Accounting water uses project*, 2010:8-20. * Stoltz, H., Jørgensen, M., Mutale, M., Zulu, A., Sipuma, R., & Lumba, W. K. (2007). Government of the Republic of Zambia; “Ministry of Local Government and Housing: Sector Capacity Study Water and Sanitation”, Lusaka. |
| Step 2. | The second part of the project involved the development of a questionnaire (Appendix 1) that was sent out to targeted experts in the region who were asked to participate in the on-line survey. As the SADC water-sector is relatively small, the targeted experts were identified by the NEPAD SANWATCE members who have knowledge of the experts in the SADC –Region. |
| Step 3. | The questionnaire was circulated to all the members in NEPAD SANWATCE with the request to fill it out and to forward the survey to their knowledgeable contacts working in the SADC region in water. |
| Step 4. | The survey data was exported and analysis of data was completed by the ‘Statistica’ software programme. |
| **PHASE 2:** |  |
| Step 1 | The follow-up survey was circulated to the networks and individuals as mentioned above. |
| **Quantitative study** | |
| **Phase 1:** |  |
| Step 1. | An online programme called, ‘Scopus.com’, was used to map the peer reviewed publication output in the SADC region. |
| **PHASE 2:** |  |
| Step 1 | The online desktop survey (as mentioned above) was conducted of private- and public institutions in the SADC region of available vacancies in the SADC water-sector and tabulated. |

Table 2: Research methodology for JLP 1.2

|  |  |
| --- | --- |
| **JLP 1.2** | |
| Step 1. | Universities, colleges and training centres from the SADC region were researched to determine the educational offering in the water sector. |
| Step 2. | Linkages between courses provided in the region, with the gaps existing in the water sector were made. |

# RESULTS

## 5.1 Qualitative analysis of the skills gaps – Phase 1

### 5.1.1 Respondent analysis

A total of 36 respondents from 28 different organizations, participated in the initial questionnaire. Experts in the water sector were approached to complete the questionnaire based on their knowledge of water sector in SADC (Table 3). **By approaching the experts, informed answers from individuals who have valuable experiences and sound knowledge in the water sector was obtained. Note that these findings were complimented by actions taken in Phase 2 of the study.**

Table 3: Details of respondents of the JLP 1.1 Survey

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Company** | **Email** | **Country** |
| T E Cloete | Stellenbosch University | eugenecloete@sun.ac.za | South Africa |
| S Farolfi | IWEGA – University of Eduardo Mandlane | farolfi@cirad.fr | Mozambique |
| Daniel CW Nkhuwa (PhD) | University of Zambia | dcwnkhuwa@unza.zm | Zambia |
| Matilda Shatunka | SNV Netherlands Development Organisation | mshatunka@snvworld.org/@yahoo.com | Zambia |
| Wilson Chifwima | Eastern Water and Sewerage Company Limited | wchifwima@ewsc.co.zm | Zambia |
| Rodwell Chandipo | ZEMA | rchandipo@necz.org.zm | Zambia |
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| Eberhard Braune | University of the Western Cape | ebraune@uwc.ac.za | South Africa |
| Justin Liyali | Western Water and Sewerage Company Limited | justinliyali@yahoo.co.uk | Zambia |
| Charles Shindaile | Southern Water and Sewerage Company Limited | shindailecm@zambia.co.zm | Zambia |
| Evans M. Chiyenge | Seeds of Hope International Partnerships | evans@sohip.org | Zambia |
| Gift Monde | Southern Water and Sewerage Company Limited | giftmonde2003@yahoo.co.uk | Zambia |
| Eiman Karar | WRC | eimank@wrc.org.za | South Africa |
| Maria Amakali | Ministry of Agriculture, Water and Forestry | gwamakali@gmail.com | NAMIBIA |
| Emma Ndhlovu | Ministry of Lands, Energy and Water Development | pyela8@yahoo.com | Zambia |
| Amos Mtonga | Chainama Hills college Hospital | mtongamos@yahoo.co.uk | Zambia |
| Keith Kennedy | CSIR | kkennedy@csir.co.za | South Africa |
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|  | CSIR |  | South Africa |
| Marius Claassen | CSIR | @csir | RSA |
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|  | CSIR | callcentre@csir.co.za | South Africa |
| Chabeli Ramolise | Moroka-Pula Lesotho | cjramolise@morokapula.co.ls | LESOTHO |
| Richard Owen | Africa Groundwater Network | richardo@zol.co.zw | Zimbabwe |
| Willie Enright | Wateright Consulting | enright@absamail.co.za | South Africa |
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| Harry Biggs | SANParks | biggs@sanparks.org | South Africa |
| Lameck Phiri | Natural Resources Development college | Lamphiri@gmail.com | Zambia |

### 5.1.2 Analysis of the primary business of respondents



Figure 1 : Business or organization type of respondents according to question 1 of the survey

Various responses were received where respondents could indicate what type of business or organization they are involved with. The primary business selection did not limit the respondents to only one choice since it is possible for organizations to have more than one function, for example an organization can be involved in both training and research.

The respondents were dominantly research organizations (50%) followed by tertiary institutions (28%) (Figure 1). It is most likely that there would be an overlap of research and tertiary institutions. This is clarified in Table 2 indicating that that the primary activity of the respondents was research (13%) and teaching and training with 8%. The rest of the respondents comprised of consulting businesses, NGO’s, National government institutions, utilities etc.

**These results suggest that the majority of the skills would be in tertiary institutions and research institutions. The non-represented sectors form a very important part of the water sector and was included in a follow up survey during the second phase of the study.**

**With the follow up survey, the questionnaire was sent out to several networks and individuals and will be discussed in more detail later in this document.**

In the second question, respondents had to choose only one primary business (Figure 2).



Figure 2 : Primary business where the respondents had only one choice

From the 28 organizations from the participants list, most participants 13 (13.39%) indicated ‘Research’ as their primary activity. These organizations include the universities, the Water Research Commission (WRC) and the Council for Scientific and Industrial Research (CSIR). This is followed by 8 (8.24%) of participants indicating ‘Teaching and training’ as a primary activity and a further 5 (5.15%) organizations indicating ‘Water resource management’ as a primary activity. The least organizations indicated ‘Networking’ (institutions whose main aim it is to organize networking opportunities as derived through conferences etc.,) and ‘Water service provision’ (3, 3.9% of organizations each) and finally, the one (1.3%) organization as ‘Operations and Utilities management (Figure 2).

It should be noted that the participants do not see their organization’s role as development networking. Or that they do not see themselves as networking informally inside or outside their workplace. Three of the organizations who chose networking as a primary activity, were organizations such as GWP-SA and WaterNet where development networking is seen as a core function of their business.

Although research and teaching are reasonably well represented, utilities, networking organisations and water service provision were under represented in the survey. These institutions were included in Phase 2 of the study.

Table 4 : Ranking of existing skills

|  |  |
| --- | --- |
| **Existing Skills** | **Percentage of Respondents** |
| Groundwater | 69% |
| Hydrology | 64% |
| Policy | 64% |
| Planning | 64% |
| Research | 61% |
| Sanitation | 61% |
| Project Management | 61% |
| Water treatment | 61% |
| Civil engineering | 58% |
| Environmental | 56% |
| Ecosystems | 53% |
| Environmental health | 53% |
| Freshwater systems | 53% |
| Geographic Information Systems | 53% |
| Human Resources | 53% |
| Water Conservation | 53% |
| Data Management | 50% |
| Waste Disposal | 50% |
| Communications | 47% |
| Hydrochemistry | 47% |
| Social Sciences | 44% |
| Management | 44% |
| Finance | 42% |
| Geography | 42% |
| Geology | 42% |
| Agriculture | 39% |
| Geochemistry | 39% |
| Information Management Systems | 39% |
| Rainwater Harvesting | 39% |
| Good Governance | 39% |
| Conflict and Mediation | 36% |
| Environmental Law | 36% |
| Marketing | 36% |
| Occupational | 36% |
| Climatology | 33% |
| Forestry | 33% |
| Waste Management | 33% |
| Chemical engineering | 31% |
| Construction | 31% |
| Coastal engineering | 28% |
| Plant maintenance/operations | 28% |
| Artisans | 25% |
| Agronomy (irrigation, soil science) | 25% |
| Ecology | 19% |

Table 4 indicates what skills currently exist in SADC according to the participants. To quote one participant’s response, “*the short (but 100% true) answer is that all of those skills, presented in table four, are here in SADC, but not sufficiently so*”.  In other words, these skills are in demand and even if they are represented in the Region, there are important gaps in these skills to be filled.

Most skills in SADC are related to Groundwater (69%); Hydrology (64%); Policy (64%); Planning (64%); Research (61%); Sanitation (61%); Project Management (61%); Water treatment (61%); Civil Engineering(58%); Environmental (56%); Ecosystems (53%); Environmental health (53%); Freshwater systems (53%) and Geographical Information Systems (GIS) - 53% (Table 4).

Limited skills within the SADC region included: Conflict Mediation (36%); Environmental Law (36%); Marketing (36%); Occupational (36%); Climatology (33%); Forestry (33%); Waste Management (33%); Chemical Engineering (31%); Construction (31%); Coastal Engineering (28%); Plant maintenance/operations (28%); Artisans (25%); Agronomy (irrigation, soil sciences) 25% and Ecology (19%).

**These results would suggest that skills in the areas of Conflict Mediation; Environmental Law; Marketing; Occupational; Climatology; Forestry; Waste Management; Chemical Engineering; Construction; Coastal Engineering; Plant maintenance/operations; Artisans; Agronomy (irrigation, soil sciences) and Ecology are not well represented in this survey. This was attributed to the fact that most respondents was from research and education institutions. This survey hence does not conclude that the limited skills as indicated do not exist within the region since the organisations representing such activities were not included in the survey. In order to address this imbalance, these institutions were contacted via specific networks in Phase 2 of the study.**

## 5.2 Quantitative analysis of research focus areas and gaps – Phase 1

The creation and maintenance of a coordinated, comprehensive, and balanced research agenda, combined with a regular assessment of the state of water research and development in SADC represents the best chance of dealing effectively with the many water crises sure to mark the 21st century. Effective research and development has a direct impact on water resource management, and promotes training and capacity building initiatives. At present, there is no consolidated report that summarizes the state of research and development in the SADC region. The study on the state of water research in development in SADC will be the first attempt to obtain a quantitative account of key research and development trends in the water sector. The broader project will contribute to, and ultimately inform the sector’s knowledge base on water research and development in SADC and provide empirical material for additional research on policy, programmes, capacity, geographic spread and financing issues related to water research and development.

**Objectives**: To examine the state of water and water related research by reporting on water research and development (R&D) in the SADC countries.

Specific:

a. To report on who is conducting water-related R&D in SADC;

b. To illustrate in major categories where and how R&D is done

c. To report on SADC’s publication record in the domain of water R&D.

Such indicators include (but are not limited to) the following:

Publications:

• Number of publications

• Publications per researcher

• Share of total publications – whole or fractional counts

• Domestic co-authored publications

• International co-authored publications

Scopus is a [bibliographic database](http://en.wikipedia.org/wiki/Bibliographic_database) containing [abstracts](http://en.wikipedia.org/wiki/Abstract_(summary)) and [citations](http://en.wikipedia.org/wiki/Citation) for [academic journal](http://en.wikipedia.org/wiki/Academic_journal) [articles](http://en.wikipedia.org/wiki/Article_(publishing)). Scopus was used to report who is conducting water-related research and development in SADC and in which focus areas (Figure 3 -5). The quantitative survey was done using Scopus that has access to a database of 2,500 journals and 11,000 books.

It was considered important to providing an integrated and interdisciplinary view of unique research strengths and vulnerabilities in the SADC region. Scopus was used to determine:

* The research strengths in SADC.
* Complimentary research strengths in areas of expertise.
* Emerging research strengths for future capitalization.
* Existing and potential collaborators in the region.

In order to conduct the research, a database query in Scopus was compiled with a subject area Environmental Sciences, as Water Sciences and Technology as a sub-discipline. Further, a filter was created to search all research to include all SADC countries.

The next stage involved categorizing the research outputs based on research focus areas which included the following categories created based on research output: Waste water; Irrigation; IWRM; Potable Water; Ecology; Pollution; Modelling; Water law; Economic development; Estuary; Climate change; Eutrophication; Energy; Erosion; Infrastructure; Ground water; Monitoring; Floods and Sanitation. Any topic not included in this list means that there were no research outputs in the area e.g. membrane filtration, biofilms, oxidation ponds etc.

*Source: Scopus, 2012*

Figure 3 : Research outputs from 2008-2012 per SADC country

A SCOPUS search was done on the research output in each SADC country during the past 5 years using the keywords “water resources”. In total, 287 peer reviewed research papers were identified, and used for this study.

South Africa produced the most research outputs with 187 or 67% of publications; followed by Tanzania with 32 publications (12%), Botswana with 23 publications (8%), Zimbabwe 12 publications (4%), Malawi with 10 publications (4%), Namibia with 6 (2%). Uganda and Angola produced 2 publications each. Mozambique, Madagascar, Zambia and Seychelles produced 1 publication each and the DRC Congo and Swaziland produced no publications (Figure 3).

**These results reflect the research-knowledgebase in the water-sector, based on research outputs by tertiary institutions, and further indicate a major gap between South Africa and other SADC countries with research capacity.**

*Source: Scopus, 2012*

Figure 4 : Research per focus areas in South Africa

Since 67% of water-related research output within the SADC region is from South African institutions, a detailed analysis was done on South African water-related research output, in order to determine in which areas research is focused. The majority of research is within the Ecology (21%) focus area, followed by Modelling (15%); IWRM (13%); Pollution 10% and Economic development 18%; Estuary focus area 7% and research within the Wastewater focus area 7%. In addition, research in focus areas which include Irrigation; Climate change; Potable water/health; Monitoring; Water Law; Eutrophication; Groundwater; Energy; Erosion; Infrastructure; Floods and Sanitation comprise, combined 21% of South African research (Figure 4).

**This research output would suggest that a gap exists for research in South Africa within the areas of Irrigation; Climate change; Potable water/health; Monitoring; Water Law; Eutrophication; Groundwater; Energy; Erosion; Infrastructure; Floods and Sanitation.**

*Source: Scopus, 2012*

Figure 5 : Research focus areas in Tanzania

A total number of publications over a five year period in Tanzania were 26. The majority of water-related research undertaken in Tanzania is within the focus area of Pollution (27%); Ecology (11%), Potable water (11%) and Water Law (12%) followed by Climate change (10%). In addition, research in focus areas Economic development; Modeling; IWRM; Irrigation; Waste water; Eutrophication; Energy; monitoring; Ground water; Floods; Sanitations; Estuary; Erosion and Infrastructure comprise, combined 31% all water-related research in Tanzania and are grouped as they individually comprise less than 5% of research (Figure 5).

**This research output would suggest that a need exists for research in Tanzania within the areas of Economic development; Modeling; IWRM; Irrigation; Waste water; Eutrophication; Energy; monitoring; Ground water; Floods; Sanitation; Estuary; Erosion and Infrastructure.**

*Source: Scopus, 2012*

Figure 6 : Research focus areas in Zimbabwe

It is important to note that the analysis was done on a total of 10 publications over a five year period. The majority of water-related research undertaken in Zimbabwe is within the focus area of Potable water (20%); Pollution (10%); Climate change (10%) Economic Development (10%); IWRM (10%); Irrigation (10%); Waste Water (10%); Eutrophication (10%) and Sanitation (10%). Very little or no research was conducted in the focus areas of Ecology; Modelling; Water law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure (Figure 6).

**This research output would suggest that a need exists for research in Zimbabwe within the areas of Ecology; Modelling; Water law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure.**

*Source: Scopus, 2012*

Figure 7 : Research focus areas in Botswana

The analysis on focus areas for Botswana was done using the 23 publications over a five year period. The majority of water-related research undertaken in Botswana is within the focus area of Ecology (35%); Pollution (13%); Modelling (13%); Monitoring (13%) and Climate Change (9%). Other research, combining Ground water; Irrigation; Floods; Potable water; Economic development; IWRM; Water Law; Waste water; Eutrophication; Energy; Sanitation; Estuary; Erosion; Infrastructure account for 17% of water-related research in Botswana and are grouped together as they comprise less than 5% of research individually (Figure 7).

**This research output would suggest that a need exists for research in Botswana within the areas of Ground water; Irrigation; Floods; Potable water; Economic development; IWRM; Water Law; Waste water; Eutrophication; Energy; Sanitation; Estuary; Erosion and Infrastructure.**

*Source: Scopus, 2012*

Figure 8 : Research focus areas in Malawi

A total of 10 publications were used in the analysis of focus areas in Malawi. The majority of water-related research undertaken in Malawi is within the focus area of Potable water (20%); Pollution (10%); Climate change (10%); Economic development (10%); IWRM (10%); Irrigation (10%); Waste water (10%) Eutrophication (10%) and Sanitation (10%). Based on the data analysed, it was further found that very little or no research was undertaken in die Ecology; Modelling; Water Law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure focus areas (Figure 8).

**This research output would suggest that a need exists for research in Malawi within the areas of Ecology; Modelling; Water Law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure.**

## 5.3 Qualitative analysis of the skills gaps – Phase 2

### 5.3.1 Respondent analysis

In phase 2 of the project, the survey-questionnaire was sent to the following network communities and individuals

* Institute of Municipal Engineers of South Africa (IMESA);
* International Water Association – East and Southern African Region (IWA-ESAR);
* Water Operators’ Partnership (WOP);
* Water Institute of South Africa (WISA)[[4]](#footnote-4);
* African Water Association (AfWA);
* EU JRC to Aquaknow.net members;
* Aquaknow.net members in the “NEPAD Southern African Network” group;
* Consortium members in the NEPAD SANWATCE
* Through SADC Water to 22 water experts in the SADC Region (Mr. Phera Ramoeli)
* African Ministers Council on Water Secretariat (AMCOW) – Mr. Baai-Mas Taal
* UNESCO IHE – Dr. Stefan Uhlenbrook
* Various individuals in the SADC Region

Although the survey-questionnaire was sent to various network-communities associated with the SADC Region, only 7 respondents were received – despite various attempts to increase the respondents. Informal feedback received indicated that some individuals indicated that they have responded to the survey in phase 1, and further, it is suspected that many potential respondents, especially in South Africa, participated in the WISA-survey as discussed in the footnote below, and did not see the need to participate in this, the NEPAD SANWATCE-survey. Due to this low number of respondents, the data was not analysed as it would not be representative of the SADC region.

However, an online search of water-related vacancies in the SADC countries was undertaken. The results of this study will be presented in detail below.

## 5.4 Quantitative analysis of research focus areas and gaps – Phase 2

**Objectives**: To examine the level of vacancies in different water-related job categories in the SADC countries.

**Specific:**

a. To report on what water-related vacancies are available in the SADC Region;

b. To illustrate in major categories of water-related vacancies in the SADC Region;

In order to conduct the research, various online websites and web portal was accessed, to extract and summarise water-related vacancies in the SADC-Region. These websites and portals include:

1. Predominantly, the web portal [www.careerjet.co.za](http://www.careerjet.co.za) (“Careerjet.co.za Vacancies,” 2012) was used which, according to the website, access 46,515,067 vacancies published on 70,864 websites worldwide. Only vacancies published from 1 January 2012 was used for this survey.
2. In addition, other relevant web-portals were also accessed and analysed[[5]](#footnote-5), as presented in table 5.
3. For South Africa, the websites of the major employers in the water-sector was accessed which include Rand Water (a water supply utility) (“RandWater Jobs,” 2012); Department of Water Affairs (“DWAF Vacancies,” 2012); Arcus Gibb (a large private engineering firm) (“RandWater Jobs,” 2012); SASOL (a para-statal supplying petroleum and gas related products) (“SASOL Vacancies,” 2012) and ESKOM (a para-statal company and South Africa’s primary electricity supplier) (“ESKOM Vacancies,” 2012).

Table 5: Internet portals used to access water-sector vacancies in the SADC region

|  |  |
| --- | --- |
| **Country** | **Internet portal/website accessed** |
| Angola | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Angola> 2. http://www.caglobalint.com/int/search.php |
| Botswana | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=botswana> 2. http://www.wuc.bw/wuc-careers.php |
| DRC | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=drc> |
| Lesotho | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=lesotho> |
| Madagascar | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Madagascar> 2. http://www.emploi-environnement.com/fr/gestion\_offre/visu\_offre.php4?reference\_offre=53197 3. http://www.madagascar-services.biz/emploi-un-technicien-de-laboratoire-un-chercheur-specialiste-en-hydrologie-isotopique/ 4. http://www.actioncontrelafaim.org/fr/content/un-responsable-programmes-eau-assainissement-et-hygiene-hf-0 5. <http://www.madagascar-services.biz/emploi-vnu-n2-volontaires-des-nations-unies-unicef/> |
| Malawi | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Malawi> 2. <http://washafrica.wordpress.com/category/countries/southern-africa/malawi/> |
| Mauritius | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Mauritius> 2. <http://gcc.clients.pageup.com.au/jobDetails.asp?sJobIDs=801923&stp=C2&sLanguage=en> 3. <http://www.afdevinfo.com/htmlreports/org/org_42937.html> |
| Mozambique | 1. http://www.careerjet.co.za/search/jobs?s=water&l=mozambique 2. http://www.newjobsinafrica.com/search?q=water 3. http://africaspin.com/openjobs/search/water/page-2 |
| Namibia | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Namibia> 2. <http://www.caglobalint.com/int/jobdetail/3325/0/plant-manager-water-treatment-plant---namibia.htm> 3. <http://www.namwater.com.na/data/Vacancies_Listings.asp> |
| Seychelles | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Seychelles> 2. <http://iwlearn.net/jobs/water-resource-management-and-project-design-specialist-seychelles-project-undp> 3. <http://jobsearch.naukri.com/job-listings-Network-Engineer-Water-Sewerage-Seychelles-PUBLIC-UTILITIES-CORPORATION--Seychelles--5-to-10-years-050412001428> |
| South Africa | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=South+Africa> 2. Nelson Mandela Bay 3. <http://www.nelsonmandelabay.gov.za/Content.aspx?objID=182> 4. <http://www.indeed.co.za/jobs?q=Water+Treatment+Plant&l=Pretoria%2C+Gauteng+0083&start=10> 5. <http://www.veoliawaterst.co.za/search.htm?q=vacancies&w=s> 6. <http://www.jobvine.co.za/jobs/search/results/?page=4&keyword=water&location=All+Locations&search=both> 7. <http://www.mosselbay.gov.za/search/2/3/water> 8. <http://hireresolve.co.za/job_adverts?locations=81,241,240,28,242,33,254,238,239,39&keywords=water> 9. <http://www.joblife.co.za/jobs/wastewater_treatment.html> 10. <http://www.makana.gov.za/index.php?option=com_docman&Itemid=26> 11. <http://southafricajobsvacancies.com/hydrogeologist-or-water-resources-engineer-job-job-in-gauteng-5304.html> 12. <http://jobs.mg.co.za/quick_search.php?sel=from_form&from_file=index> 13. <http://www.andm.gov.za/Municipal_News/Pages/Sanitation-Programmes.aspx> 14. [http://za.adsdeck.net/jobs/=water-recruitment#](http://za.adsdeck.net/jobs/=water-recruitment) |
| Swaziland | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Swaziland> |
| Tanzania | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Tanzania> 2. http://www.devex.com/en/projects/zanzibar-urban-services-project-zusp-in-tanzania-consultancy-services-for-design-review-and-construction-supervision-of-storm-water-drainage-for-zanzi |
| Zambia | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Zambia> 2. <http://www.niras.com/Jobs/JobVacancyOverview/Development-Consulting/Zambia-Water-Sector-Experts.aspx> |
| Zimbabwe | 1. <http://www.careerjet.co.za/search/jobs?s=water&l=Zimbabwe> 2. <http://zimbabweanjobs.blogspot.com/2012/01/project-assistant-water-sanitation.html> |

Information extracted from the web-portals as presented in table 5, were classified and categorised job descriptions as presented in table 6.

Table 6: Career opportunities in the water sector

|  |
| --- |
| **1. ENGINEERS** |
|  |
| Process Design Engineer |
| Process Control Engineer |
| Biochemical Engineer |
| Irrigation/Drainage Engineer |
| Civil Engineer |
| Municipal Engineer |
| Geotechnical/Soil/Geological Engineer |
| Hydraulics/Water Resources Engineer |
| Environmental Engineer |
| Structural Engineer |
| Water Systems/Pipeline Engineer |
| Electrical Engineer |
| Chemical Engineer |
| Biochemist |
| Water and Waste Water Engineer |
|  |
| **2. BIOLOGIST** |
|  |
| Microbiologist |
| Aquatic Scientist |
| Biochemist |
| Biotechnologist |
| Eco-toxicologist |
| Molecular and Cell Biologist |
|  |
| **3. ENVIRONMENTAL SCIENTISTS AND OFFICERS** |
|  |
| Environmental Planners |
| Ecologists, Water Research Officers |
| GIS Specialist |
| Water Resource Management Specialist |
| Hydrologist |
| Hydro-geologist |
| Groundwater Modeller |
| Environmental Project Manager |
|  |
| **4. TECHNICIANS** |
|  |
| Water Quality Specialist |
| Water Treatment Specialist |
| Waste and Waste Water Treatment Plant Operator |
| Electrician |
| Boilermaker |
| Fitter and Turner |
| Hydrometry Technician |
| Geo-hydrological Technician |
| Instrument Maker |
| Quality Control Technician |
| Meter-Reader |
| Laboratory Technician |
| Plumber |
| Welder |
| Process controller (hydroelectric power plant) |
| Water Truck Driver and Load Operator |
| Water Cooler Service Technician |
| Water Licensing Officer |
|  |
| **5. CHEMISTS** |
|  |
| Analytical Chemist |
| Research Chemist |
| Product Development Chemist |
|  |
| **6. GENERAL** |
|  |
| Social Scientist |
| Meteorologist |
| Quality Assurance Manager |
| Executive Management (with technical background) |
| Senior Management (with technical background) |
| Human Resources |
| Managers (Production) |
| Managers (Water Treatment) |
| Project Manager |
|  |
| **7. OTHER** |
| Hydro-graphic Surveyor |
| Water and Sanitation Scientist/Engineer / Area Manager |
| Sales Technologist/ Rep/ Account Manager (Water Treatment) |
| Water Vacancies (UNSPECIFIED) |

*Source: Adopted from (Water Research Commission, 2004)*

Based on the methodology as described above, a total number of 1081 water-sector vacancies in the SADC-region were categorised. The results of the findings are presented in table 7.

Table 7: Number of water-sector vacancies in the SADC-region. January 2012 – April 2012

|  |  |  |
| --- | --- | --- |
| **Country** | **Number of Water-Sector Vacancies** | **% of Water-Sector Vacancies** |
| SOUTH AFRICA | 1009 | 93.34% |
| ANGOLA | 15 | 1.39% |
| ZAMBIA | 10 | 0.93% |
| DRC | 7 | 0.65% |
| MAURITIUS | 6 | 0.56% |
| MOZAMBIQUE | 6 | 0.56% |
| MADAGASCAR | 5 | 0.46% |
| NAMIBIA | 5 | 0.46% |
| SEYCHELLES | 5 | 0.46% |
| BOTSWANA | 4 | 0.37% |
| ZIMBABWE | 4 | 0.37% |
| TANZANIA | 3 | 0.28% |
| MALAWI | 2 | 0.19% |
| LESOTHO | 0 | 0.00% |
| SWAZILAND | 0 | 0.00% |
|  |  |  |
| TOTAL | 1081 | 100.00% |

*Source: (“Careerjet.co.za Vacancies,” 2012); (“SASOL Vacancies,” 2012); (“ESKOM Vacancies,” 2012); (“RandWater Jobs,” 2012); (“DWAF Vacancies,” 2012) and various as presented in table 5.*

As evident from table 7, 1009 of water-sector vacancies were calculated within South Africa, followed by Angola (15); Zambia (10); Democratic Republic of Congo (DRC) with 7 Mauritius and Mozambique (6) respectively; Madagascar; Namibia and Seychelles with 5 each; Botswana and Zimbabwe with 4 each; Malawi (2) and no vacancies in Lesotho and Swaziland. It is thus evident that by far, most of the water-sector vacancies are based in South Africa.

In order to further determine which water-sector jobs were the most in demand, vacancies were summarised and ranked according to most frequent. The results are presented in figure 10.

It is thus evident that the top 20 water-sector vacancies in the SADC-Region is for Water and Sanitation Scientist/Engineer/Area Managers (403); Civil Engineers (128); Hydraulics/Water Resources Engineers (63); Water Treatment Specialists (62); Senior Management (with technical background) (41); Project Managers (36); Sales Technologist/ Rep/ Account Manager (Water Treatment) (32); Process Control Engineers (28); Human Resources (25); Electricians (21); Water and Waste Water Engineers (20); Social Scientists (20); Water Systems/Pipeline Engineers (16); Environmental Project Manager (12); Managers (Water Treatment) (12); Process Design Engineers (11); Hydro-graphic Surveyors (11); Fitter and Turners (10); Irrigation/Drainage Engineers (9) and Water Vacancies (UNSPECIFIED) (9).

The remainder of the number of vacancies can be seen in table 8.

Table 8: Water sector jobs in the SADC-region. January 2012-April 2012

|  |  |  |
| --- | --- | --- |
| **Rank** | **Vacancy** | **Number of Vacancies in the SADC-Region** |
| 1 | OTHER Water and Sanitation Scientist/Engineer / Area Manager | 403 |
| 2 | ENGINEERS Civil Engineer | 128 |
| 3 | ENGINEERS Hydraulics/Water Resources Engineer | 63 |
| 4 | TECHNICIANS Water Treatment Specialist | 62 |
| 5 | GENERAL Senior Management (with technical background) | 41 |
| 6 | GENERAL Project Manager | 36 |
| 7 | OTHER Sales Technologist/ Rep/ Account Manager (Water Treatment) | 32 |
| 8 | ENGINEERS Process Control Engineer | 28 |
| 9 | GENERAL Human Resources | 25 |
| 10 | TECHNICIANS Electrician | 21 |
| 11 | ENGINEERS Water and Waste Water Engineer | 20 |
| 12 | GENERAL Social Scientist | 20 |
| 13 | ENGINEERS Water Systems/Pipeline Engineer | 16 |
| 14 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Environmental Project Manager | 12 |
| 15 | GENERAL Managers (Water Treatment) | 12 |
| 16 | ENGINEERS Process Design Engineer | 11 |
| 17 | OTHER Hydro-graphic Surveyor | 11 |
| 18 | TECHNICIANS Fitter and Turner | 10 |
| 19 | ENGINEERS Irrigation/Drainage Engineer | 9 |
| 20 | OTHER Water Vacancies (UNSPECIFIED) | 9 |
| 21 | ENGINEERS Chemical Engineer | 8 |
| 22 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Environmental Planners | 8 |
| 23 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Water Resource Management Specialist | 8 |
| 24 | ENGINEERS Structural Engineer | 7 |
| 25 | TECHNICIANS Instrument Maker | 7 |
| 26 | GENERAL Executive Management (with technical background) | 7 |
| 27 | GENERAL Managers (Production) | 7 |
| 28 | ENGINEERS Geotechnical/Soil/Geological Engineer | 6 |
| 29 | ENVIRONMENTAL SCIENTISTS AND OFFICERS GIS Specialist | 5 |
| 30 | ENGINEERS Electrical Engineer | 4 |
| 31 | TECHNICIANS Waste and Waste Water Treatment Plant Operator | 4 |
| 32 | TECHNICIANS Boilermaker | 4 |
| 33 | TECHNICIANS Laboratory Technician | 4 |
| 34 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Ecologists, Water Research Officers | 3 |
| 35 | TECHNICIANS Quality Control Technician | 3 |
| 36 | TECHNICIANS Plumber | 3 |
| 37 | ENGINEERS Municipal Engineer | 2 |
| 38 | ENGINEERS Environmental Engineer | 2 |
| 39 | ENGINEERS Biochemist | 2 |
| 40 | BIOLOGIST Microbiologist | 2 |
| 41 | TECHNICIANS Water Quality Specialist | 2 |
| 42 | TECHNICIANS Process controller (hydroelectric power plant) | 2 |
| 43 | GENERAL Quality Assurance Manager | 2 |
| 44 | BIOLOGIST Biochemist | 1 |
| 45 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Hydro-geologist | 1 |
| 46 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Groundwater Modeller | 1 |
| 47 | TECHNICIANS Hydrometry Technician | 1 |
| 48 | TECHNICIANS Meter-Reader | 1 |
| 49 | TECHNICIANS Water Truck Driver and Load Operator | 1 |
| 50 | TECHNICIANS Water Cooler Service Technician | 1 |
| 51 | TECHNICIANS Water Licensing Officer | 1 |
| 52 | CHEMISTS Analytical Chemist | 1 |
| 53 | CHEMISTS Research Chemist | 1 |
| 54 | ENGINEERS Biochemical Engineer; BIOLOGIST Biotechnologist; BIOLOGIST Aquatic Scientist; BIOLOGIST Ecotoxicologist; BIOLOGIST Molecular and Cell Biologist; ENVIRONMENTAL SCIENTISTS AND OFFICERS Hydrologist; TECHNICIANS Geo-hydrological Technician; TECHNICIANS Welder; CHEMISTS Product Development Chemist; GENERAL Meteorologist | 0 |

*Source: (“Careerjet.co.za Vacancies,” 2012); (“SASOL Vacancies,” 2012); (“ESKOM Vacancies,” 2012); (“RandWater Jobs,” 2012); (“DWAF Vacancies,” 2012) and various as presented in table 5.*

Since 1009 of water-sector job vacancies was found to be in South Africa, a detail assessment of Water-sector jobs is presented for South Africa.

Table 9: Water-sector job vacancies in South Africa. January 2012-April 2012

|  |  |  |
| --- | --- | --- |
| **Rank** | **Vacancy** | **South-Africa** |
| 1 | OTHER Water and Sanitation Scientist/Engineer / Area Manager | 390 |
| 2 | ENGINEERS Civil Engineer | 113 |
| 3 | TECHNICIANS Water Treatment Specialist | 62 |
| 4 | ENGINEERS Hydraulics/Water Resources Engineer | 59 |
| 5 | GENERAL Senior Management (with technical background) | 39 |
| 6 | GENERAL Project Manager | 32 |
| 7 | OTHER Sales Technologist/ Rep/ Account Manager (Water Treatment) | 29 |
| 8 | ENGINEERS Process Control Engineer | 28 |
| 9 | GENERAL Human Resources | 21 |
| 10 | TECHNICIANS Electrician | 21 |
| 11 | ENGINEERS Water and Waste Water Engineer | 20 |
| 12 | GENERAL Social Scientist | 19 |
| 13 | ENGINEERS Water Systems/Pipeline Engineer | 13 |
| 14 | GENERAL Managers (Water Treatment) | 12 |
| 15 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Environmental Project Manager | 10 |
| 16 | OTHER Hydro-graphic Surveyor | 10 |
| 17 | TECHNICIANS Fitter and Turner | 10 |
| 18 | ENGINEERS Irrigation/Drainage Engineer | 9 |
| 19 | ENGINEERS Chemical Engineer | 8 |
| 20 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Water Resource Management Specialist | 8 |
| 21 | TECHNICIANS Instrument Maker | 7 |
| 22 | GENERAL Managers (Production) | 7 |
| 23 | OTHER Water Vacancies (UNSPECIFIED) | 6 |
| 24 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Environmental Planners | 6 |
| 25 | ENGINEERS Structural Engineer | 6 |
| 26 | GENERAL Executive Management (with technical background) | 6 |
| 27 | ENGINEERS Geotechnical/Soil/Geological Engineer | 6 |
| 28 | ENGINEERS Process Design Engineer | 5 |
| 29 | ENVIRONMENTAL SCIENTISTS AND OFFICERS GIS Specialist | 5 |
| 30 | ENGINEERS Electrical Engineer | 4 |
| 31 | TECHNICIANS Waste and Waste Water Treatment Plant Operator | 4 |
| 32 | TECHNICIANS Boilermaker | 4 |
| 33 | TECHNICIANS Laboratory Technician | 4 |
| 34 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Ecologists, Water Research Officers | 3 |
| 35 | TECHNICIANS Quality Control Technician | 3 |
| 36 | ENGINEERS Municipal Engineer | 2 |
| 37 | BIOLOGIST Microbiologist | 2 |
| 38 | TECHNICIANS Water Quality Specialist | 2 |
| 39 | TECHNICIANS Process controller (hydroelectric power plant) | 2 |
| 40 | TECHNICIANS Plumber | 1 |
| 41 | ENGINEERS Environmental Engineer | 1 |
| 42 | ENGINEERS Biochemist | 1 |
| 43 | GENERAL Quality Assurance Manager | 1 |
| 44 | BIOLOGIST Biochemist | 1 |
| 45 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Hydro-geologist | 1 |
| 46 | ENVIRONMENTAL SCIENTISTS AND OFFICERS Groundwater Modeller | 1 |
| 47 | TECHNICIANS Meter-Reader | 1 |
| 48 | TECHNICIANS Water Truck Driver and Load Operator | 1 |
| 49 | TECHNICIANS Water Cooler Service Technician | 1 |
| 50 | TECHNICIANS Water Licensing Officer | 1 |
| 51 | CHEMISTS Research Chemist | 1 |
| 52 | TECHNICIANS Hydrometry Technician; CHEMISTS Analytical Chemist; ENGINEERS Biochemical Engineer; BIOLOGIST Aquatic Scientist; BIOLOGIST Biotechnologist; BIOLOGIST Ecotoxicologist; BIOLOGIST Molecular and Cell Biologist; ENVIRONMENTAL SCIENTISTS AND OFFICERS Hydrologist; TECHNICIANS Geo-hydrological Technician; TECHNICIANS Welder; CHEMISTS Product Development Chemist; GENERAL Meteorologist | 0 |

*Source: (“Careerjet.co.za Vacancies,” 2012); (“SASOL Vacancies,” 2012); (“ESKOM Vacancies,” 2012); (“RandWater Jobs,” 2012); (“DWAF Vacancies,” 2012) and various as presented in table 5.*

From table 9, it is evident that the top twenty water-sector vacacies in South Africa is for Water and Sanitation Scientist/Engineer / Area Managers (390); Civil Engineers (113); Water Treatment Specialists (62); Hydraulics/Water Resources Engineer (59); Senior Management (with technical background) (39); Project Managers (32); Sales Technologist/ Rep/ Account Manager (Water Treatment) (29); Process Control Engineers (28); Human Resources (21); Electricians (21); Water and Waste Water Engineers (20); Social Scientists (19); Water Systems/Pipeline Engineers (13); Environmental Project Managers (10); Hydro-graphic Surveyors (10); Fitter and Turners (10); Irrigation/Drainage Engineers (9); Chemical Engineers (8)and Water Resource Management Specialists (8). The remainder of the number of vacancies can be seen in table 9.

## 5.5 Qualitative analysis of skills development and training (Task JLP1.2)

Greater coordination between the organization in the Water Sector and the HET is crucial in addressing the skills requirements (EWSETA, 2010). This section provides a description of the nature and type of training provision in the region (Figure 9).



Figure 9 : Approach to skills development in the SADC region

Respondents were asked what SADC’s approach is to skills development.[[6]](#footnote-6) The respondents indicated that SADC makes use of mostly Further Education and Training (FET) (75%) and Capacity building strategies and financing (69%), to improve its skills. Between 61 per cent and 67 per cent of the respondents indicated that SADC uses methods such as mentorship (67%), higher education and training (HET) (64%), in service training (64%) and bursary support (61%) to address its lack of skills obstacle. Fifty eight per cent specified that internships are ways to bridge the skills gaps and 53% revealed that recognition of prior learning and short courses are means to approach its skills development (Figure 9).

**These results would suggest that many organizations support training provided within formal education structures such as Further Education Training; capacity building strategies; mentorships and Higher Education Training and support the different types of training being used (Figure 9).**



Figure 10: Different types of training

When respondents were asked who they use in order to deliver further training to the institutions, 53% indicated that Higher Education and Training institutions were used, followed by Accredited Service Providers (50%) and FET institutions 44% (Figure 10).

**This would suggest that the most organizations prefer that skill development be undertaken at formal and accredited training institutions such as HET institutions. A survey was done to determine which institutions in the SADC provide accredited courses (Table 10 - 13).**

## 5.6 Current accredited educational offering in the SADC water sector

Various studies were previously undertaken in the water-sector of the SADC-region, to determine skills gaps. One of these studies, The SADC Training Needs Assessment Report the (Matete, n.d.) highlighted that training should take place at the level of decision makers, professionals already working in the sector and career seekers. These are broad categories in which training can take place.

A large number of existing accredited courses are offered in the SADC region and are presented in tables 10-13.

Table 10 : Accredited Training Providers in SADC

|  |  |
| --- | --- |
| **Name** | **Contact Details** |
| Africon Training Academy Africon Engineering (Pty) LTD - 583/0120\*\* | Zibeth Joubert B-Ed (Hon)  012 427 2358  012 427 2010  ZibethJ@africon.co.za |
| City of Cape Town – Water\*\* | R Francis  021-593 4642 |
| Vantage\*\* | Mr N Khambule  033-342 1675  033-345 6592  pmb@vantaetm.co.za |
| The Water Academy\*\* | Kevin Treffry-Goatley  031-332 6043  031-332 1850  kevin@thewateracademy.co.za |
| National Community Water and Sanitation Training Institute (NCWSTI)\*\* | Prof George Djolov  015 268-3266  015 268-3270  082 888-2745  djolov@ncwsti.co.za |
| City of Tshwane Metro – Premos\*\* | Frans Labuscagne  012-308 0020  012-308 0041  nicm@tshwane.gov.za |
| Envirogreen\*\* | Lynette Swart  018-297 7455  018-297 7458  lynette@envirogreen.co.za |
| Mvula Trust\*\* | Isle Wilson  011-403 3425  011-403 1260  ilse@mvula.co.za |
| BECO Institute for Sustainable Bus\*\* | Bas Kothuis  021-689 7117  021-689 7116  bkothuis@beco.co.za |
| East Rand Water Care Company\*\* | Rodney Barnes  082-905 9160  011-929 7101  rodneyb@erwat.co.za |
| City of Cape Town Water\*\* | Raymond Francis  021-532 0762  021-531 6284  carmen jones@capetown.gov.za |
| Foundation for People Centre Development\*\* | David de Waal  012-362 2908  012-362 2463  ddwa@afrosearch.co.za |
| Sediba Training Academy\*\* | Seboka Kopung  kopung@intekom.co.za |
| Amatola Water Amanzi Skills development in conjunction with the Energy SETA (Sector Education Training Authority) | <http://www.amatolawater.co.za/home> |
| SADC Land and Water Management Applied Research and Training  Programme with financing from the European Union | [www.sadc.int/water](http://www.sadc.int/water) |
| Institute of Water and Sanitation Development (IWSD) Zimbabwe | <http://www.university-directory.eu/Zimbabwe/Institute-of-Water-and-Sanitation-Development-IWSD.html> |
| UNESCO-IHE  Tailor made courses and PHD’s to be obtained. |  |
| E-learning  United Nations Environment Programme | <http://www.unep.or.jp/> |
| EWSETA special courses | [www.EWSETA.org.za](http://www.EWSETA.org.za) |
| Waternet offers Short Training Courses, Regional MSc in IWRM. | [www.waternetonline.org](http://www.waternetonline.org) |
| GWP SA sponsored short courses | www.gwp.org |
| Capnet sponsored short courses | [www.cap-net.org](http://www.cap-net.org) |
| Waternet capacity building programme where they offer Masters courses and professional training courses. | [www.waternetonline.org](http://www.waternetonline.org) |
| IWEGA Short Training Courses in Water Economics and Governance | www.iwega.org |

*Source:\*\*(http://www.fanrpan.org/documents/d00487/SADC-EU\_training\_call.pdf*)

*Other sources:* [*http://www.amatolawater.co.za/home*](http://www.amatolawater.co.za/home)*;* [*www.sadc.int/water*](http://www.sadc.int/water)*;* [*http://www.university-directory.eu/Zimbabwe/Institute-of-Water-and-Sanitation-Development-IWSD.html*](http://www.university-directory.eu/Zimbabwe/Institute-of-Water-and-Sanitation-Development-IWSD.html)*; http://www.unep.or.jp/; www.ewseta.org.za; www.gwp.org;* [*www.cap-net.org*](http://www.cap-net.org) *www.waternetonline.org www.iwega.org*

Table 11 : Accredited public universities offering water courses in the SADC region

|  |  |
| --- | --- |
| **Country** | **Name of University** |
| Angola | University of Agostinho Neto |
| Botswana | University of Botswana |
| DRC | University of Goma |
| University of Kinshasa |
| Madagascar | University of Antananarivo  University of Fianarantsoa |
| University of North Madagascar |
| University of Toamasina |
| Malawi | University of Malawi |
| University of Muzuzu |
| Mauritius | University of Mauritius |
| Mozambique | University of Eduardo Mondlane |
| University of Pedagogica |
| Namibia | University of Namibia |
| South Africa | Rhodes University |
| University of Pretoria |
| University of Western Cape |
| University of Kwa-Zulu Natal\* |
| University of Cape Town |
| University of Stellenbosch\* |
| Cape University of Technology\* |
| Swaziland | University of Swaziland |
| Tanzania | Sokoine University of Agriculture |
| University Dar es Salaam |
| Zambia | Copperbelt University |
| University of Zambia |
| Zimbabwe | University of Zimbabwe |
| National University of Science and Technology |

*Source: Matete, 2010. in SADC Training Needs Assessment Report Final*

*\*Was not listed in original source but added by NEPAD SANWATCE*

Table 12 : Botswana Sector–wide Training Program

|  |  |  |
| --- | --- | --- |
| **Training Topic** | **Level** | **Organisation/Division** |
| **Short-term training:** | | |
| Management and Supervision | Professional | DWA - Design, Construction & Contracting Div DWA - Groundwater Div District Councils |
| Technicians | District Councils |
| Leading Teams | Artisans | District Councils |
| Project Management | Professional | DWA - Electro-Mechanical Div DWA - Water Conservation and Quality Div DGS |
| Project Management | Technicians | DWA - Design, Construction & Contracting Div |
| Contract Management and Supervision | Professional | DWA - Hydrology & Water Resources Div DWA - Operations & Maintenance Div |
|  | DWA - Design, Construction & Contracting Div District Councils |
| Contract Management and Supervision | Technicians | DWA - Hydrology & Water Resources Div DWA - Operations & Maintenance Div District Councils |
| Civil Engineering Software | Professional | DWA - Design, Construction & Contracting Div |
| Technicians | DWA - Design, Construction & Contracting Div |
| Basic Survey and Design | Technicians | District Councils |
| Data Collection | All levels | DWA - Operations & Maintenance Div |
| Public Relations Skills | Professional | DWA - Design, Construction & Contracting Div District Councils |
| Public Relations Skills | Technicians | DWA - Design, Construction & Contracting Div |
|  | District Councils |
| Public Relations Skills | Artisans | DWA - Design, Construction & Contracting Div District Councils |
| Maintenance Planning | Professionals | DWA - Electro-Mechanical Div |
| Technicians | DWA - Electro-Mechanical Div |
| Artisans | DWA - Electro-Mechanical Div |
| Maintenance | Technicians | DWA - Operations & Maintenance Div |
| Artisans | DWA - Operations & Maintenance Div |
| Pollution Control | Professional | DWA - Water Conservation and Quality Div |
| Technicians | DWA - Water Conservation and Quality Div |
| Basic Computer Skills (Word & Excel) | All levels | DWA - Electro-Mechanical Div DWA - Departmental Management Div |
| Public Financial Management and Accounting | Professional | DWA - Departmental Management Div |
| Human Resource Management | Professional | DWA - Operations & Maintenance Div |
| Training Management | Professional | DWA - Departmental Management Div |
| Training Needs Analysis | Professional | DWA - Departmental Management Div |
| Train-the-Trainer & Presentation Skills | Professional & Technical | DWA - All Divisions |
| **Long-term training:** | | |
| Environmental Assessment MSc | Professional | DWA - Hydrology & Water Resources Div |
| Hydrogeology Modelling PhD level | Professional | DWA - Groundwater Div DGS - Hydrogeology Div |
| Environmental Geology MSc | Professional | DGS - Hydrogeology Div |
| Telemetry BEng (Controls & Instrumentation) | Technical | DWA - Electro-Mechanical Div |
| Field Hydrogeology Dip AppSc | Artisan | DGS - Hydrogeology Div |
| **Other:** | | |
| Water Strategies, Water Harvesting and Demand Management - Work Attachment | Professional | DWA - Water Conservation and Quality Div |
| Development of Pollution Control Measures - Consultant assistance | Professional | DWA - Water Conservation and Quality Div |
| Human Resource Planning - Work Attachment | Professional | DWA - Departmental Management Div |

*Source: (BOTSWANA MINISTRY OF MINERALS, ENERGY & WATER RESOURCES AFFAIRS, 2006)*

Various institutions provide training opportunities for individuals in Botswana (Table 12). These institutions are predominantly divisions within the Department of Water Affairs (DWA). Some technical training as in the case of Management and Supervision; Leading teams; Basic Survey and Design and Public Relations Skills are provided at a District Council Level. The DGS - Hydrogeology Division also provide training in Field Hydrogeology Dip AppSc and Environmental Geology MSc.

The courses available at EWSETA, based in South Africa, focus primarily on FET in water and waste water reticulation, water & wastewater treatment operation and on community water, health, hygiene and sanitation. It is offered on level National Qualification Framework[[7]](#footnote-7) (NQF) 2, 3 and 4 (Table 10).

Table 13 : Courses offered at EWSETA

|  |  |
| --- | --- |
| **Water Courses Available from EWSETA** | |
| |  | | --- | | FET: Water & Wastewater Reticulation NQF Level 2 and Level 3 | | National Certificate in Water Reticulation NQF Level 2 and Level 3.   |  | | --- | |  | |
| FET: Water & Wastewater Reticulation NQF Level 3 and Level 4 | |  | | --- | | National Certificate in Water Reticulation NQF Level 3 and Level 4 | |
| FET: Water & Wastewater Reticulation NQF  Level 4 | |  | | --- | | National Certificate in Water Reticulation NQF Level 4 | |
| FET: Water & Wastewater Treatment Operation NQF Level 2, level 3 and Level 4 | National Certificate in Water Treatment Operation NQF Level 2, level 3 and level 4 |
| FET: Community Water, Health, Hygiene & Sanitation Promotion NQF Level 2 and Level 3. | National Certificate in Community Water, Health, Hygiene & Sanitation Promotion (Sanitation Builder) NQF Level 2 and level 3.  National Certificate in Community Water, Health,  Hygiene & Sanitation Monitoring (SMME) NQF Level 3 |
| |  | | --- | | FET: Community Water, Health, Hygiene & Sanitation Facilitation NQF Level 4 | | National Certificate in Community Water, Health, Hygiene & Sanitation Facilitation (Operation and Maintenance, Educator) NQF Level 4 |

*Source: EWSETA, 2010*

Based on the information provided in Tables 10-13, it is clear that various training institutions exist within particularly South Africa, and various institutions offer water-related training such as WaterNet; Capnet; IWEGA; UNESCO-IHE and GWP-SA**. Further, there are many Higher Education and Training Institutions in SADC, but is unclear in which areas they specialise in, and should be investigated further in order to breach skills gaps and requirements.**

## 5.7 Skill gap analysis according to existing data

Various studies have been conducted in the SADC-region, with the aim to identify the water-sector skills gaps. In order to undertake this study, the results of these studies were sourced, and in some cases accessed through the internet. The results of these studies were assessed, and recommendations as obtained through these studies analysed, and are presented as follows:

### 5.7.1 Energy and Water Sector Education and Training Authority (EWSETA )

Energy and Water Sector Education and Training Authority (EWSETA) is one of 21 Sector Education & Training Authorities (SETAs) established in South Africa in terms of the Skills Development Act of 1998.

In accordance with this Act, sector specific bodies (SETAs) have been set up to encourage skills development through the establishment of a system of levies and grants, the registration of new learners and the quality assurance of training providers and assessors. (“Energy and Water Sector Education and Training Authority (EWSETA),” 2012)

At the EWSETA the courses on offer cover NQF levels 1-4. The learners who registered for the EWSETA courses in 2010 - 2011 are mostly learners following the NQF 2 level courses. The total number of learners who registered for courses on the NQF 2 level was 676 and a further 43 learners registered for the NQF 3 level courses and 185 learners registered for NQF 4 level courses (Table 14). Note that NQF 2-4 levels refer to National Certification. Not one learner registered in 2010-2011 for the General Education and Training Certificate in Water Services (GETC) NQF Level 1. This course is especially suitable for the young learners finishing their high school (grade 12) certificate. It is an entry level course in the water sector and it could serve as a motivation for the youth to expand their abilities and FET opportunities in water.

The NQF level 1-4 courses will add value to water sector and it should be encourage by government as well as by NEPAD SANWATCE.

Table 14 : EWSETA courses and registered learners

|  |  |  |  |
| --- | --- | --- | --- |
| **Qualification Title** | **SAQA ID** | **Learnership Title** | **Learners Registered** |
| FET: Water & Wastewater Reticulation NQF Level 2 | 60169 | National Certificate in Water Reticulation NQF Level 2 | 106 |
|  | National Certificate in Wastewater Reticulation NQF Level 2 | 108 |
| FET: Water & Wastewater Reticulation NQF Level 3 | 60155 | National Certificate in Water Reticulation NQF Level 3 | 0 |
|  | National Certificate in Wastewater Reticulation NQF Level 3 | 0 |
| FET: Water & Wastewater Reticulation NQF Level 4 | 60189 | National Certificate in Water Reticulation NQF Level 4 | 0 |
|  | National Certificate in Wastewater Reticulation NQF Level 4 | 0 |
| FET: Water & Wastewater Treatment Operation NQF Level 2 | 58951 | National Certificate in Water Treatment Operation NQF Level 2 | 187 |
|  | National Certificate in Wastewater Treatment Operation NQF Level 2 | 233 |
| FET: Water & Wastewater Treatment Operation NQF Level 3 | 60190 | National Certificate in Water Treatment Operation NQF Level 3 | 43 |
|  | National Certificate in Wastewater Treatment Operation NQF Level 3 | 0 |
| FET: Water & Wastewater Treatment Operation NQF Level 4 | 61709 | National Certificate in Water Treatment Operation NQF Level 4 | 0 |
|  | National Certificate in Wastewater Treatment Operation NQF Level 4 | 0 |
| FET: Community Water, Health, Hygiene & Sanitation Promotion NQF Level 2 | 61689 | National Certificate in Community Water, Health, Hygiene & Sanitation Promotion (General) NQF Level 2 | 0 |
|  | National Certificate in Community Water, Health, Hygiene & Sanitation Promotion (Sanitation Builder) NQF Level 2 | 42 |
| FET: Community Water, Health, Hygiene & Sanitation Monitoring NQF Level 3 | 64589 | National Certificate in Community Water, Health, Hygiene & Sanitation Monitoring (General) NQF Level 3 | 0 |
|  | National Certificate in Community Water, Health, Hygiene & Sanitation Monitoring (Sanitation Builder) NQF Level 3 | 0 |
|  | National Certificate in Community Water, Health, | 0 |
|  | Hygiene & Sanitation Monitoring (SMME) NQF Level 3 |  |
| FET: Community Water, Health, Hygiene & Sanitation Facilitation NQF Level 4 | 61669 | National Certificate in Community Water, Health, Hygiene & Sanitation Facilitation (General) NQF Level 4 | 25 |
|  | National Certificate in Community Water, Health, Hygiene & Sanitation Facilitation (Operation and Maintenance) NQF Level 4 | 60 |
|  | National Certificate in Community Water, Health, Hygiene & Sanitation Facilitation (Educator) NQF Level 4 | 0 |
|  | National Certificate in Community Water, Health, Hygiene & Sanitation Facilitation (NVC) NQF Level 4 | 100 |
| General Education and Training Certificate in Water Services (GETC) NQF Level 1 | 48495 | General Education and Training Certificate in Water Services (GETC) NQF Level 1 | 0 |

*Source: EWSETA for learners 2010-2011*

The report (Energy & Water Services Sector (EWSETA), 2010) further provide possible reasons why the numbers of registration at EWSETA are small:

* There are financial constraints and to follow any FET course are expensive for the average citizen in South Africa;
* A small number of learners are aiming to qualify higher than NQF 2 level;
* The awareness of the existence of these courses among the learners and citizens are low and therefore EWSETA should increase and focus on their marketing, advertising and PR methods.

### 5.7.2 Scarce skills per category according to existing data

### 5.7.2.1 South Africa

In the South African context the critical skills in need are cognitive skills such as problem solving, learning to learn, language and literacy skills, mathematical skills, ICT skills and working in teams. Scare skills refer to those occupations in which there is a scarcity of qualified and experienced people. It is either because such skilled people are not available (absolute scarcity) or they are available but do not meet employment criteria (Energy & Water Services Sector (EWSETA), 2010)

Table 15 : Scarce skills Identified and number of professionals needed in South Africa (Sourced from Workplace Skills Plan Data 2010-2011:105)

|  |  |  |
| --- | --- | --- |
| **No.** | **Scarce Skills Identified** | **No. of people to be trained as stipulated in the Workplace Skills Plan 2011- 2012** |
| **1** | Engineers | Not specified by employers |
| **2** | Project Managers | Not specified by employers |
| **3** | Surveyors and architectures | Not specified by employers |
| **4** | Analytical Biochemistry, microbiologist | Not specified by employers |
| **5** | Scientists | Not specified by employers |
| **6** | Artisans | Not specified by employers |
| **7** | Process controllers | Not specified by employers |
| **8** | Plumbing, welding ,electrical | 20 |
| **9** | Civil Engineer | 1 |
| **10** | Construction Manager | 1 |
| **11** | Payroll Clerk | 1 |
| **12** | Fitter & Turner | Not specified by employers |
| **13** | Millwright | 9 |
| **14** | Water resource technician | Not specified by employers |
| **15** | Planning Technologist | Not specified by employers |
| **16** | Plant Operator | Not specified by employers |
| **17** | Classified Water Plant Operator | 21 |
| **18** | Engineers with GCC | 1 |
| **19** | Female CA | 1 |
| **20** | Transport and Waste Management | 1 |
| **21** | Cost Account in Waste/System/Waste Auditors | 3 |
| **22** | Diesel Mechanic | 1 |
| **23** | Medical and Chemical Specialist Drive Code 14 | 2 |
| **24** | Artisans | 20 |
| **25** | Artisans | 20 |
| **26** | Process Controllers | 40 |
| **27** | Water Control Officers | 3 |
| **28** | Engineer | 8 |
| **29** | Software Developer | 2 |
| **30** | Instrument Mechanists | 4 |
| **31** | Process Controller Class IV & V | 6 |
| **32** | Hydro geological modelling | 1 |
| **34** | Design Engineer | 2 |
| **35** | Water Works Fitter/Mechanical | 5 |
| **36** | Information technology communications | 20 |
| **37** | Mechanical Technicians | 10 |
| **38** | Water and Waste Treatment Process Operations – NQF 2 | 20 |
| **39** | Occupational Health and Safety Training | 60 |
| **40** | Financial and Risk Management (including stores, Assets and Payroll Admin) | Not specified by employers |

*Source: Workplace Skills Plan Data 2010-2011:105*

Occupational Health and Safety Training is identified to be the highest number of professionals needed in the water sector (Table 15). The next scare skills of professionals needed are Water and Waste Treatment Process Operations NQF2 and Process Controllers with each area needing 40 professionals each. Information technology communications, artisans, classified plant operator, plumbing, welding and electrical skills are also in high demand with each area needing 20 professionals (Table 10). Other skills that are needed in smaller numbers are Water Control Officers,

Engineers, Software Developers, Instrument Mechanists, Process Controllers, Class IV & V, Hydro geological modelling, Design Engineers, Water Works, Fitter/Mechanical, Information technology communications and Mechanical Technicians.

Table 16 : Critical skills identified and number of who needs training ((Energy & Water Services Sector (EWSETA), 2010)

|  |  |  |
| --- | --- | --- |
| **No.** | **Critical Skills Priorities Identified** | **No. of people to be trained as stipulated in the Workplace Skills Plan2011 – 2012** |
| **1** | PC Training | 8 |
| **2** | Health and Safety | 31 |
| **3** | Driving Skills | 15 |
| **4** | Arc Welding | 3 |
| **5** | Chlorine Training | 80 |
| **6** | Scaffolding | 10 |
| **7** | Underground setting course | 60 |
| **8** | Advanced underground setting course | 20 |
| **9** | In house training | 30 |
| **10** | Electrical Level 1 | 4 |
| **11** | Electrical level 0 | 1 |
| **12** | Fitters | 2 |
| **13** | Plumbers | 1 |
| **14** | Water Purification | 1 |
| **15** | Administration | 3 |
| **16** | Technical & Sales officer | 19 |
| **17** | Fire fighters | 4 |
| **18** | SHE awareness training | 26 |
| **19** | Safety officer course | 1 |
| **20** | Budget control NQF level1 | 5 |
| **21** | Budget management skills | 5 |
| **22** | Communication Skills | 19 |
| **23** | Computer skills | 83 |
| **24** | Conflict handling | 32 |
| **25** | Delegation skills | 2 |
| **26** | Drafting skills | 1 |
| **27** | Drawing Skills | 1 |
| **28** | First Aid Skills | 28 |
| **29** | Spindlier Skills | 10 |
| **30** | Tax Skills | 2 |
| **31** | VIP PAYE submission workshop | 2 |
| **32** | People | 15 |
| **33** | HIV/AIDS | 15 |
| **34** | Compliance & Risk management | 1 |
| **35** | IMS Compliance | 1 |
| **36** | Time management | 1 |
| **37** | Emerging Leadership Programme | 6 |
| **38** | Tax Updates | 2 |
| **39** | Snr MDP | 2 |
| **40** | Project Management | 5 |
| **41** | MCITP Enterprise Edition | 1 |
| **42** | LIMS Basic | 1 |
| **43** | Advanced MS SQL | 1 |
| **44** | Adriot Configuration Basic Course | 1 |
| **45** | Forklift certification | 3 |
| **46** | Basic lab & Instrument Training | 2 |
| **47** | Technical Report Writing | 5 |
| **48** | Lubrication Essentials | 2 |
| **49** | Bid Specification Committee Training | 10 |
| **50** | Minute Taking | 5 |
| **51** | People Management skills | 10 |
| **52** | Risk Management | 20 |
| **53** | Supervisor Water NQF 5 | 1 |
| **54** | Water and Waste Water Process Controllers NQF 3 | 5 |
| **55** | Water and Waste Water Treatment Process Operations NQF 2 | 5 |
| **56** | Supervisors | 10 |
| **57** | Managerial | 7 |
| **58** | Customer Care staff | 30 |
| **59** | Advanced Operator Training | 1 |
| **60** | Basic Environmental Awareness | 16 |
| **61** | Dangerous Goods Training | 12 |
| **62** | Fleet Management | 1 |
| **63** | HANOMAG Operator | 3 |
| **64** | Hazardous Materials Transport | 15 |
| **65** | HIRA(Hazardous Identification of Risk Assessment) | 1 |
| **66** | Incident Investigation | 6 |
| **67** | ISO4001 | 4 |
| **68** | Landfill Operations | 4 |
| **69** | Marketing Rep Waste Training | 6 |
| **70** | New Legislation | 2 |
| **71** | PASTEL Payroll | 2 |
| **72** | Purchasing | 1 |
| **73** | RMS | 15 |
| **74** | SHE training | 6 |
| **75** | SHE course | 1 |
| **76** | SHE Risk Management | 14 |
| **77** | Artisan development programme | 30 |
| **78** | management development programme | 10 |
| **79** | skills programme | 30 |
| **80** | Learnership | 30 |
| **81** | ABET | 96 |
| **82** | Telemetry Training | 18 |
| **83** | Effective Debt Collection | 10 |
| **84** | Customer Service | 100 |
| **85** | Plumber Artisan Training | 5 |
| **86** | Electrical Artisan Training | 5 |
| **87** | Boiler Artisan | 5 |
| **88** | Carpentry and Joinery Artisan Training | 5 |
| **89** | Motor Mechanic Artisan Training | 3 |
| **90** | Diesel Mechanic Artisan Training | 3 |
| **91** | Supervisory Training | 30 |
| **92** | Management Development Programme | 20 |
| **93** | Water and wastewater process operation Learnership | 40 |
| **94** | Moderator Training | 20 |
| **95** | Mentoring and Coaching | 40 |
| **96** | Recognition of Prior Learning on National Certificate in water and wastewater process operation | 25 |
| **97** | MS Project for Managers | 15 |
| **98** | Advanced water purification | 20 |
| **99** | Counselling & EAP Certification | 1 |
| **100** | Water reticulation]pipe laying | 20 |
| **101** | Return on investment On Training | 1 |
| **102** | Windmill repair and maintenance | 15 |
| **103** | FSS Training | 1 |
| **104** | Diesel engines repair and maintenance | 6 |
| **105** | Principles of stores and inventory management | 1 |
| **106** | Supply chain management | 10 |
| **107** | Basic accounting/managing accounts receivable | 13 |

*Source: Workplace Skills Plan Data 2010-2011:105*

The top four critical skills in which people need to be trained in are Customer Service (100 people), Adult Based Education and Training (96), Computer skills (83) and Chlorine Training (80 people). Sixty people need training in Underground setting while 30-40 people need training in each of the following areas – these are Health and Safety, In house training, conflict handling, Customer Care staff, Artisans Development Programme, skills programme and learnership (Table 16).Whilst employers in the water sector are generally able to provide a list of skills that they perceive as scarce, they are not always able to quantify the level of scarcity (ESWETA 2011). Therefore when employers are asked to identify the number of people to be trained, they are not always able to do so.

Table 17 : Skills shortage in South Africa

|  |  |  |  |
| --- | --- | --- | --- |
| **Engineers** | **Socio-Economic** | **Management** | **Artisans/ Technicians** |
| 3,000 Civil engineers required.  Sector operates on 43% capacity of engineers. The need is to fill it the missing 57% | 7,200 Health and Hygiene Practitioners. | Total of 23,000 needed in Water Sector.  To narrow it down, it is: | 4,000 artisans and technicians needed. |
|  | 2,280 Community Development Workers. | 1,200 technical management (engineers with management skills) |  |
|  | 718 Environmental Health Officers | 246 Construction project managers |  |
|  | 2,055 Environmental Health Practitioners | 12,000 with development and financial management skills |  |
|  | 660 ‘soft skills’ e.g. Economist, Lawyers, Social Scientist etc. | 3,000 elected officials needs Adult Base Educational Training |  |
|  |  | 8,000 elected officials need to upgrade skills in Local Governance |  |
|  |  | 530 needs to be trained once elected |  |

*Source: DWAF, 2009*

In South Africa the Department of Water Affairs and Forestry (DWAF) determined that a serious skills shortage exists in a number of areas (Table 17). The results are self - explanatory and will not be discussed in detail.

### 5.7.2.2 Zambia

In Zambia, the Rural Water Supply and Sanitation (RWSS) requires maximum 208 people to bridge its skills gap. Zambia’s water sector needs 10 people in the Ministry of Local Governance and Housing (MLGH)/ Department of infrastructure and support services (DISS) on central level and 5 people in the Ministry of local governance and housing/ Accounting department. The biggest skills gap lies in the District Municipal Councils with a shortage of 108 people. The private sector needs strengthening in employing maximum 72 individuals – they consist out of consultants, auditors, test pump supervisors etc. (Table 18).

In the Urban Water Supply and Sanitation sector, the public sector seems to be satisfactory with its staff status since the public sector requires only 1 person in the Ministry of Local Governance and Housing (MLGH)/ Department of Infrastructure and Support Services (DISS) and 1 in Devolution Trust Fund. In Commercial Utilities a total number of 136 people with degrees (HET) are needed and 18 consultants are required (Table 18).

In Water Research Management (WRM) the number of professionals needed in the public sector in 2003 were 220, the staff number did not increase till 2005, however, the number of WRM professionals increased. Eight consultants were also required during the time of this study.

In terms of Water Quality Laboratories, there was a need to upgrade the laboratories, its facilities and its staff numbers. This was needed in the public sector, in the commercial and utilities sector as well as in the private sector.

The Research and Development sector requires 15 professionals. Five researchers are needed at the University of Zambia (UNZA), 5 at the National Institute of Scientific and Industrial Research/ Water Resource Research Unit (WRRU) and 5 individuals are needed centrally in the Rural Water Supply and Sanitation sector (Table 18).

Table 18 : Annual additional staff requirements (all converted to full-time positions) ZAMBIA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sub-sector/ areas** | **Public sector/ parastatal** | **District and Municipal Councils** | **Commercial Utilities** | **Private Sector** |
| RWSS | MLGH/ DISS Central: 5 MLGH Acc. Central:2-3 MLGH/ DISS Regional: 8 | District Councils: 108 Municipal Councils: 10 |  | Consultants First 3 y.: 12-18  After 3 y.: 8-14  Auditors 0.5  Drilling 10-15 rigs w. staff Borehole siting 4-10 teams  Drilling supervision 10-15 supervisors  Test pump supervisor  Some technicians  Local well-diggers and masons Significant number |
| Urban WSS | MLGH/ DISS Central: 1 DTF: 1 |  | More staff with degrees/diplomas. If 25% of total staff = 136 | Consultants: 18 Contractors Skilled and unskilled labour |
| WRM | 1999/2003 scenario: 195-220 mainly provincial + district levels 2005 scenarios: No staff increase, but more WRM planners etc. |  |  | Consultants: 8 Contractors Skilled and unskilled labour |
| Water Quality Labs | Upgrading of lab. facilities and staffing |  | Upgrading of lab. facilities and staffing | Upgrading of lab. facilities and staffing |
| Research and Dev. | UNZA WRM Centre: 5 NISIR/ WRRU: 5 RWSS Centre: 5 |  |  |  |

*Source: (Stoltz et al., 2007:7)*

### 5.7.2.3 Botswana

According to the Botswana National Water Master Plan (BOTSWANA MINISTRY OF MINERALS, ENERGY & WATER RESOURCES AFFAIRS, 2006) the Department of Water Affairs (DWA), Department of Geological Survey (DGS), Water Utilities Corporation (WUC), District Councils and Department of Waste Management and Environmental Pollution require the following staff and associated skills as presented in table 19.

Table 19: Botswana Government staff and skills requirement

|  |  |  |
| --- | --- | --- |
| **Institution** | **Department** | **Staff and skills required** |
| Department of Water Affairs (DWA), | Hydrology and Water Resources Division | **Staff required:** Hydrologists  **Skills required:** Contract Management & Supervision (Professionals &Technicians);  Environmental Assessment (Professional) |
| Groundwater Division | **Staff required:** Groundwater Modeller Professional.  **Skills required:** Planning and Management (Professionals);  Groundwater Modelling Professionals |
| Design and Construction Division | **Staff required:** Civil Engineers  **Skills required:** Contract Management and Supervision (Professionals);  Civil Engineering Software (Professionals)  (Civilcad, Mapinfo) (Technicians);  Public Relations (Professionals; Technicians Artisans);  Management and Supervision (Professionals; Technicians) |
| Electro-Mechanical Division | **Staff required**: Electrical and Mechanical Engineers; Electrical and Mechanical Technicians  **Skills required:** Maintenance Planning & Scheduling (Professionals; Technicians; Artisans);  Contract Management & Supervision (Professionals and Technicians). |
| Operations and Maintenance Division | **Staff required:** Customer Relations Officers; Financial Officers; Water Engineers; HRD (either in-house or corporate function)  **Skills required:** Maintenance (Professionals; Technicians; Artisans);  Contract Management & Supervision (Professionals; Technicians);  Data collection Professionals; Technicians  HR Management Station Managers |
| Water Conservation and Quality Division | **Staff required:** Pollution Control Officers (4); Conservation Officers (4); Public Education Officer.  **Skills required:** Presentation Skills Professionals (Technicians; Artisans) |
| Information Technology Division | **Staff required:** Technical Officers  **Skills required:** Systems development (Professionals; Technicians);  Applications development (Professionals and Technicians;  Billing system support (Professionals Technicians  Data Security Professionals Technicians;  Project Management Professionals Technicians. |
| Departmental Management Division | **Staff required:** Human Resource Planning  **Skills required:** Public Financial Management and Accounting (Management);  Basic Computing - Administration Staff;  Management and Supervision - Middle managers;  Human Resource Planning Professional |
| Department of Geological Survey |  | **Staff required:** Hydrogeological Modeller  **Skills required:** Groundwater Modelling Professional;  Environmental Geology Professional;  Field Hydrology Artisan (for upgrading)  Contract Management & Supervision – Professional; Technical. |
| Department of Waste Management and Pollution Control |  | Information Technology area |
| District Councils |  | **Skills required:** Project Management Professionals; Technicians; Artisans;  Supervision and Leadership Professionals;  Public Relations Skills Professionals; Technicians; Artisans;  Staff Supervision Technicians;  Basic Survey and Design Technicians. |

*Source: (BOTSWANA MINISTRY OF MINERALS, ENERGY & WATER RESOURCES AFFAIRS, 2006)*

Based on information provided in table 19, it is evident that a wide range of professionals; technicians and artisans are required in order to meet the staff requirements of the Botswana government. The staff include Hydrologists; Groundwater Modellers; Civil Engineers; Electrical and Mechanical Engineers; Electrical and Mechanical Technicians; Customer Relations Officers; Financial Officers; Water Engineers; HRD (either in-house or corporate function); Pollution Control Officers; Conservation Officers; Public Education Officers; ICT Technical Officers; Human Resource Planning; Hydrogeological Modeller; Project Management Professionals; Supervision and Leadership Professionals; Public Relations Skills Professionals; Staff Supervision Technicians; Basic Survey and Design Technicians.

### 5.7.2.4 SADC - general

In 2010, a study was undertaken for the SADC region, focussing on training needs (Matete, n.d.). In the recommendations of the report, training needs are identified for

1. Decision makers – Basic and non-0technical courses which should not be more than 3 days through regional bodies such as GWP who has experience in dealing with decision makers.
2. Professionals already working in the sector – specialised training focussed on water accounts they need to compile. These professionals include hydrologists, hydro-geologists, statisticians, environmentalists, economists and planners. Course should also not take more than 7 days.
3. Career Seekers in Economic accounting of water- targeted at students who are interested in the water sector at undergraduate and post-graduate levels. Various institutions exist throughout SADC who can offer such courses.

# CONCLUSIONS/RECOMMENDATIONS

**The assessment of the skills shortages was conducted using an electronic survey as a pilot project (Phase 1) in the SANWATCE member countries (i.e. South Africa, Zambia, Botswana, Mozambique and Malawi). This was followed-up by a survey to all SADC countries, through network organizations and individual requests.**

* The majority of the skills are in higher education and research institutions.
* The Phase 1 survey excluded utilities, networking organisations, and water service provision that form a very important part of the water sector and should be included in a follow up survey
* Limited skills in the areas of Conflict Mediation; Environmental Law; Marketing; Occupational; Climatology; Forestry; Waste Management; Chemical Engineering; Construction; Coastal Engineering; Plant maintenance/operations; Artisans; Agronomy (irrigation, soil sciences) and Ecology were identified. This might be because of the bias of the survey towards research and higher education institutions and therefore does not suggest that these skills are absent in the region. Future surveys should investigate and include organisations under - represented in this survey.
* Using only the current SANWATCE members limited the scope of this survey to include a small sample of SADC countries.
* Very few respondents were received during phase 2 (rest of SADC-countries), despite various attempts to increase the respondents. Informal feedback received indicated that some individuals indicated that they have responded to the survey in phase 1, and further, it is suspected that many potential respondents, especially in South Africa, participated in the WISA-survey

**Recommendation**

***Collaboration should be established with the Water Institute of South Africa, to exchange and compare results of the various studies.***

**A further skills assessment was done using an electronic database (SCOPUS) of research outputs in all of the SADC countries.**

* The knowledge base in the sector producing research outputs and further indicates a major gap between South Africa and other SADC countries with research capacity.
* A need exists for research in South Africa within the areas of Irrigation; Potable water/health; Climate change; Monitoring; Water Law; Eutrophication; Groundwater; Energy; Erosion; Infrastructure; Floods and Sanitation in order to bridge the skills gaps which exist in South Africa
* Major gaps in crucial areas e.g. water law, ground water, eutrophication, energy, floods, erosion, infrastructure, sanitation, floods, and governance. Again the lack of research in these areas reflects in practice, the major challenges in terms of water management. It would hence be very difficult for these countries to make decisions that are evidence based, leading to the many problems with water management in the region. This results in the lack of infrastructure development a concomitant lack of water supply and sanitation etc.
* A need exists for research in Tanzania within the areas of Economic development; Modeling; IWRM; Irrigation; Waste water; Eutrophication; Energy; monitoring; Ground water; Floods; Sanitations; Estuary; Erosion and Infrastructure in order to bridge the skills gaps which exist in Tanzania.
* A need exists for research in Zimbabwe within the areas of Ecology; Modelling; Water law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure in order to bridge the skills gaps which exist in Zimbabwe.
* A need exists for water related research in Botswana within the areas of Ground water; Irrigation; Floods; Potable water; Economic development; IWRM; Water Law; Waste water; Eutrophication; Energy; Sanitation; Estuary; Erosion; Infrastructure in order to bridge the skills gaps which exist in Botswana.
* A need exists for research in Malawi within the areas of Ecology; Modelling; Water Law; Monitoring; Ground water; Energy; Floods; Estuary; Erosion and Infrastructure in order to bridge the skills gaps which exist in Malawi.
* The use of the specific search engine may have limited and excluded some other valuable research outputs in the water sector.

**Recommendation:**

***Research driven capacity building should become a major focus of future investment in SADC in order to address the major backlog in terms of research output in the relevant priority areas for specific countries. These can be determined through consultation at a high governmental level and further be identified using a more search criteria using software programmes like SciVal Spotlight and SciVal Expert.***

**During phase 2 of the project, various online portals were assessed to determine the level of vacancies in different water-related job categories in the all SADC countries. Two objectives were identified namely a) to report on what water-related vacancies are available in the SADC Region and b) to illustrate in major categories of water-related vacancies in the SADC Region.**

* Most water-sector vacancies are within South Africa (93%), followed by Angola; Zambia and Democratic Republic of Congo (DRC). During this study, relatively few water-sector vacancies were found for the other SADC-countries.
* This study concluded that the top water-sector vacancies in the SADC-Region is for Water and Sanitation Scientist/Engineer/Area Managers; Civil Engineers; Hydraulics/Water Resources Engineers; Water Treatment Specialists; Senior Management (with technical background); Project Managers; Sales Technologist/ Rep/ Account Manager (Water Treatment); Process Control Engineers; Human Resources; Electricians; Water and Waste Water Engineers; Social Scientists; Water Systems/Pipeline Engineers; Environmental Project Manager; Managers (Water Treatment); Process Design Engineers; Hydro-graphic Surveyors; Fitter and Turners and Irrigation/Drainage Engineers
* The top water-sector vacacies in South Africa is for Water and Sanitation Scientist/Engineer / Area Managers; Civil Engineers; Water Treatment Specialists; Hydraulics/Water Resources Engineer; Senior Management (with technical background); Project Managers; Sales Technologist/ Rep/ Account Manager (Water Treatment); Process Control Engineers; Human Resources; Electricians; Water and Waste Water Engineers; Social Scientists; Water Systems/Pipeline Engineers; Environmental Project Managers; Hydro-graphic Surveyors; Fitter and Turners; Irrigation/Drainage Engineers; Chemical Engineers and Water Resource Management Specialists.

**Recommendation:**

***Private- and public institutions provide the employment opportunities for individuals within the water-sector. Training institutions (such as Higher Education and Training institutions; Accredited Service Providers and Further Education and Training institutions)*** ***should align their educational offering to meet this need.***

**Universities, colleges and training centers from the SADC region were researched to determine the educational offering in the water sector.**

* Many organizations support training provided within formal education structures such as Further Education Training; capacity building strategies; mentorships and Higher Education Training and support the different types of training being used.
* Most organizations prefer that skill development be undertaken at formal and accredited training institutions such as HET institutions.
* Various training institutions exist within particularly South Africa, and various institutions offer water-related training such as WaterNet; Capnet; IWEGA; UNESCO-IHE and GWP-SA.
* Further, there are at least HET in each SADC country, but is unclear in which areas they specialise in, and should be investigated further in order to breach skills gaps and requirements.

**Recommendation:**

***As indicated earlier, training institutions (such as Higher Education and Training institutions; Accredited Service Providers and Further Education and Training institutions)*** ***should align their educational offering to meet the need of industry***

***Funding should also be made available for supporting scholars to attend the appropriate courses that are already available in the SADC region.***

**Existing studies of skills shortages and gaps were used as baseline data from recent relevant studies.**

* In South Africa various scares skills were identified which included Process Controllers; Artisans; Water and Waste Treatment Process Operations – NQF 2; Information technology communications officers; Plumbing, welding ,electrical; Engineers; Project Managers; Surveyors and architectures; Analytical Biochemistry, microbiologist; Scientists and Occupational Health and Safety Training practitioners.
* The South African department of Water Affairs and further indicated that approximately 3,000 Civil Engineers; 7,200 Health and Hygiene Practitioners; 23,000 Managers and 4,000 artisans and technicians are required.
* In Zambia, approximately 760 water professionals are required between the public sector/ parastatals; District and Municipal Councils; Commercial Utilities and Private Sector.
* In Botswana a wide range of professionals; technicians and artisans are required in order to meet the staff requirements of the Botswana government. The staff include Hydrologists; Groundwater Modellers; Civil Engineers; Electrical and Mechanical Engineers; Electrical and Mechanical Technicians; Customer Relations Officers; Financial Officers; Water Engineers; HRD (either in-house or corporate function); Pollution Control Officers; Conservation Officers; Public Education Officers; ICT Technical Officers; Human Resource Planning; Hydrogeological Modeller; Project Management Professionals; Supervision and Leadership Professionals; Public Relations Skills Professionals; Staff Supervision Technicians; Basic Survey and Design Technicians.
* Based on information from a SADC wide study undertaken for SADC, training needs were identified for:
  + Decision makers – Basic and non-technical courses which should not be more than 3 days through regional bodies such as GWP who has experience in dealing with decision makers.
  + Professionals already working in the sector – specialised training focussed on water accounts they need to compile. These professionals include hydrologists, hydro-geologists, statisticians, environmentalists, economists and planners. Course should also not take more than 7 days.
  + Career Seekers in Economic accounting of water- targeted at students who are interested in the water sector at undergraduate and post-graduate levels. Various institutions exist throughout SADC who can offer such courses.
* Data regarding the exact numbers of skilled people for the other countries are not known.

**Recommendation:**

***It is evident that artisans; technicians and professionals are required in order to meet the needs of the water-sector in SADC. Some data are available for specific SADC countries such as South Africa, Zambia and Botswana, and further over-view requirements are provided for the SADC-region. For other SADC countries the data might not be available, and in an absence of such data, other research data should be used as indicators. Such data include the quantitative studies undertaken in this study.***

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# ANNEXURE I: Questionnaire of Task JLP1.1 and partially of KM2.1

|  |
| --- |
| **Question 1: What type of business/organization are you?  Please select all that apply.** |
| |  | | --- | | Tertiary Education | | Research | | Water Utility | | Consulting | | Private Sector - Agriculture | | Private Sector – Energy | | Private Sector – Manufacturing | | Private Sector - Mining | | Local Government | | Regional Government | | National Government | | Non-Governmental Organization [NGO] | | Civil Society Organization [CSO] | | River Basin Organization | | Other, please specify | |

|  |
| --- |
| **Question 2: What are all your activities of your organization?**  **Please select all that apply.** |
| |  | | --- | | Policy making | | Planning | | Teaching and training | | Water resource management | | Water service provision | | Finance | | Communications | | Research | | Operations and Utilities management | | Networking | | Other, please specify | |

|  |
| --- |
| **Question 3: What is your main/primary activity?**  **Select only one.** |
| |  | | --- | | Policy making | | Planning | | Teaching and training | | Water resource management | | Water service provision | | Finance | | Communications | | Research | | Operations and Utilities management | | Networking | |

|  |
| --- |
| **Question 4: Which skills exist your organization?** |
| |  |  | | --- | --- | |  | SKILLS EXIST IN  YOUR ORGANIZATION | | Agriculture/Agricultural Engineering |  | | Artisans and technicians e.g. boiler makers, welders, plumbers, drillers |  | | Agronomy |  | | Chemical Engineering |  | | Civil Engineering |  | | Climatology |  | | Coastal engineering |  | | Communications |  | | Conflict Resolution/Mediation |  | | Construction Project Managers |  | | Cultural and Social science |  | | Data Management |  | | Ecosystems and their management |  | | Environmental Health |  | | Environmental law |  | | Environmental |  | | Financial Management |  | | Forestry |  | | Freshwater systems |  | | Geographic Information Systems |  | | Geochemistry |  | | Geography |  | | Geology / Geophysics |  | | Groundwater |  | | Human Resources |  | | Hydrochemistry |  | | Hydrology |  | | Industrial Ecology |  | | Information Management Systems |  | | Institutional Management |  | | Marketing and communications |  | | Occupational health and safety skills |  | | Policy |  | | Planning |  | | Plant maintenance &operation |  | | Rainwater Harvesting technologies |  | | Research and Development |  | | Sanitation |  | | Sector Governance |  | | Project Management |  | | Water conservation |  | | Waste disposal |  | | Waste handling (including hazardous) |  | | Water treatment |  | |

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| **Question 5a: YOUR CURRENT ORGANISATIONAL APPROACH TO SKILLS DEVELOPMENT:**  **Please select forms of skills development activities or interventions at your organization  - and further select what interventions are needed in the SADC region.** |
| |  |  |  | | --- | --- | --- | |  |  | | | Interventions at your organisation | Interventions needed in SADC | | FET (Further Educational Training) |  |  | | HET (Higher Educational Training) |  |  | | In service training |  |  | | Bursary support |  |  | | Internships |  |  | | Mentorship |  |  | | Recognition of Prior Learning (RPL)Short courses |  |  | | Capacity building strategy and financing |  |  | | Other-Please specify below |  |  | |

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| If selected 'other', please specify here. |
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| **Question 5b: WHO DOES THE TRAINING?** |
| |  | | --- | | Further Educational Training (FET) institution | | Higher Educational Training (HET) institution | | Accredited Service Provider | | Other, please specify | |

**Question 6: Are you aware of any capacity development strategies or skills audits that have been carried out in your country or in the SADC region?   
Please specify.**

6.1 Do you have a formalized knowledge management system? If so, what does it entail?

6.2. Do you have a specific group of stakeholders that use the KMS? If so, who are they?

6.3. Do you use a specific electronic and/or other platform/s (e.g. workshops, conferences, publications etc.) as your knowledge management strategy?

6.4. Is there a need for a SADC wide Knowledge information system? Why do you say that?

**Question 7: THANK YOU FOR YOUR VALUABLE INPUT.**

Should you not mind contacting you in the future, please provide us with the following optional information.

Name (required)

Email (required)

Country (required)

# ANNEXURE II: Analysis of water related research in the SADC region 2008-2012

Refer to attached document

1. The WISA is currently undertaking a similar project to determine educational skills gaps in the South Africa. A detail description of this is provided under *Qualitative analysis of the skills gaps – Phase 2* of this document. [↑](#footnote-ref-1)
2. Software programmes used to search for and access post-graduate research papers from Higher Education Institutions. [↑](#footnote-ref-2)
3. The WISA is currently undertaking a similar project to determine educational skills gaps in the South Africa. [↑](#footnote-ref-3)
4. WISA is currently working on the NUFFIC project together with UNESCO-IHE.  The project is looking at the skills within the Water Services and IWRM sector in South Africa.  WISA is working with Tshwane University of Technology on the Water Services portion and with the Cape Peninsula University of Technology on the IWRM portion of the project, and have been looking at what skills are required for each occupational profile in the different areas mentioned, as well as looking at whether or not there is a need for recurriculation of courses to address the skills that are required.

   WISA has developed a questionnaire, which has been sent to all the members in the WISA database (approximately 3841 people). For the purpose of the project they have focused on employees in municipalities; water boards; catchment management agencies; water user associations as well as the Department of Water Affairs. Discussions are continuing between NEPAD SANWATCE and WISA to determine if information can be exchanged. [↑](#footnote-ref-4)
5. An extensive on-line search was conducted to access water-sector vacancies in the SADC-Region, with varying results, especially in other SADC-countries but South Africa. These results are presented later in this document (table 7). [↑](#footnote-ref-5)
6. Note that this question was asked to experts from the SADC water-sector during the questionnaire-survey in Phase 1. [↑](#footnote-ref-6)
7. The South African National Qualifications Framework (SANQF) identifies 8 levels of qualifications. Level 1 is associated with the level of education of Grade 9, and level 8 is a Masters or doctorate (a PhD). General Education and Training (GET) comprises only of level 1 (Grade 9). For Further Education and Training, the levels are 2 to 4 (National Certificates) and for Higher Education and Training, the levels are 5 to 8 (Diplomas, Honours, Bachelors, Masters and PhD) (Hochman and Mahasha, 2009). [↑](#footnote-ref-7)