European Commission

JRC SCIENCE AND POLICY REPORT

NEPAD Southern African Water Centres of Excellence Report on task JLP1.1 and JLP1.2

A study on the requirements in higher education and within training for practitioners in the SADC water sector.

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

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Abstract

The NEPAD SANWATCE network investigation in collaboration with the European Commission Joint Research Centre looks into the skills shortages that exist in the SADC region in water resources management, and further discusses how the Water Centres of Excellence could better address sector expertise and advocacy for sector development in the region.

List of Acronyms

Cap-net	
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
IWEGA	
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
UNESCO-IHE	
US	University of Stellenbosch

UWC	University of Western Cape
UNZA	University of Zambia
WaterNet	
WASH	Water Sanitation and Hygiene
WRC	Water Research Commission
WRM	Water Research Management
WRRU	Water Resources Research Unit

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1. EXECUTIVE SUMMARY

The South African Development Community (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] (approximately 2500 members);
    - African Water Association (AfWA);
    - JRC to Aquaknow.net community 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 training needs relevant to the development of the water sector are in higher education and research institutions.

[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.

- 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.
- 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 to 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; Cap-net; 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.
- 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.

To match with skills and professional needs

- 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.

By countries:

- Data regarding the exact numbers of skilled people for the other countries are not known.
- 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 top water-sector vacancies 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.
- 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.

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].
- 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. There already exist formal degree programmes at many institutions that do this, as well as through accredited short courses and workshops.
- 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. This could be done through establishing a scholarship program.
- 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. Research outputs and government funding of projects could be used to access the latter.

[2] Software programmes used to search for and access post-graduate research papers from Higher Education Institutions.

2. 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.

3. 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).

4. 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];
- African Water Association (AfWA);
- EC JRC to Aquaknow.net community members;

[3] The WISA is currently undertaking a similar project to determine educational skills gaps in the South Africa.

- 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.

5. 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
Hartley Muchenje	Department of Water Affairs	hartleymuchenje@yahoo.com	Zambia
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	giftmonde2003@yahoo.co.uk	Zambia

	Limited		
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	CSIR		South Africa
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Richard Owen	Africa Groundwater Network	richardo@zol.co.zw	Zimbabwe
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David Love	WaterNet, SADC subsidiary	dlove@waternetonline.org	Botswana and Zimbabwe
Lara van Niekerk	CSIR	lvnieker@csir.co.za	RSA
Ashton	CSIR	amaherry@csir.co.za	South Africa
noma nes	Institute of water and sanitation	noma@iwsd.co.zw	Zimbabwe
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

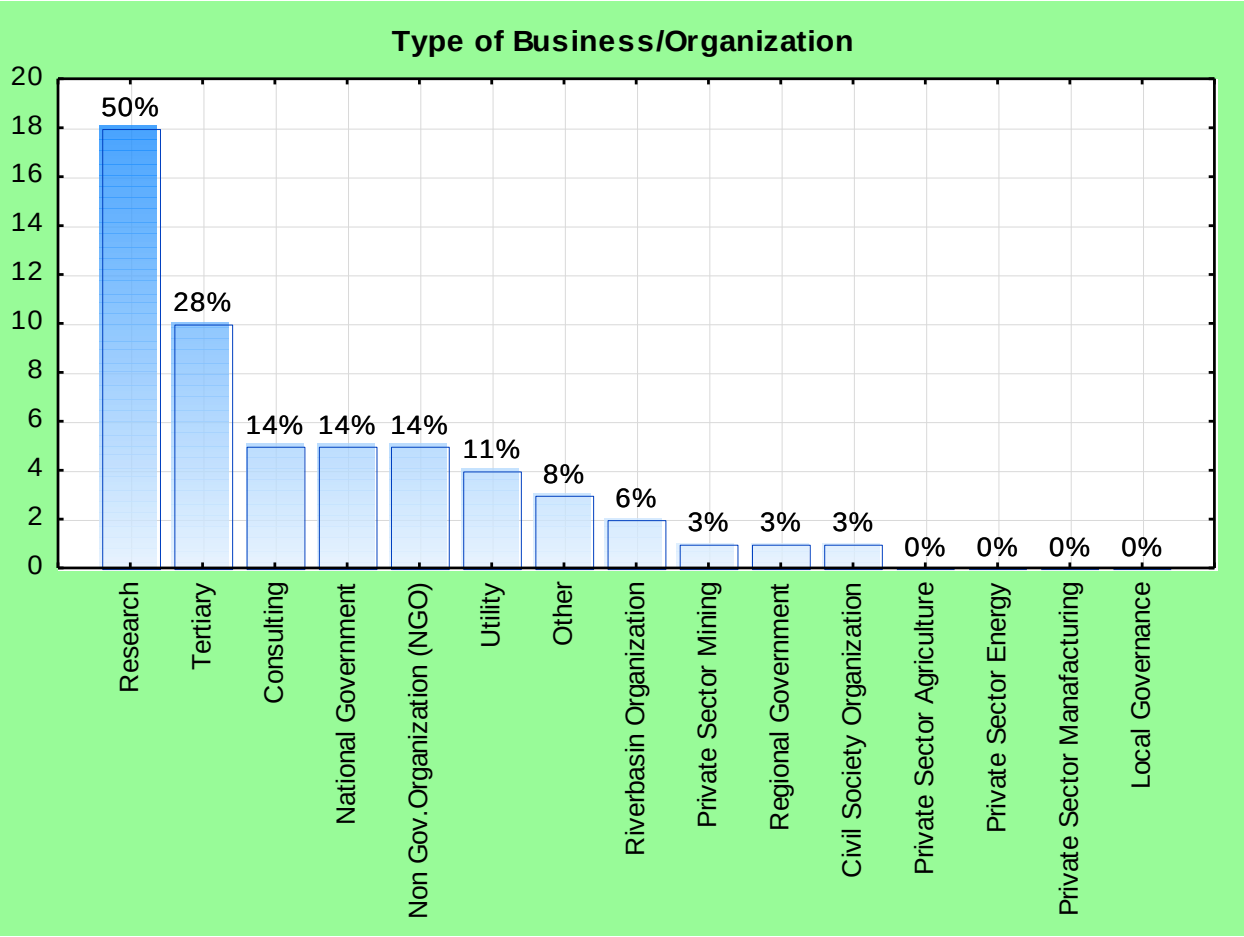


Figure 1 : Business or organization type of respondents according to question 1 of the survey

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).

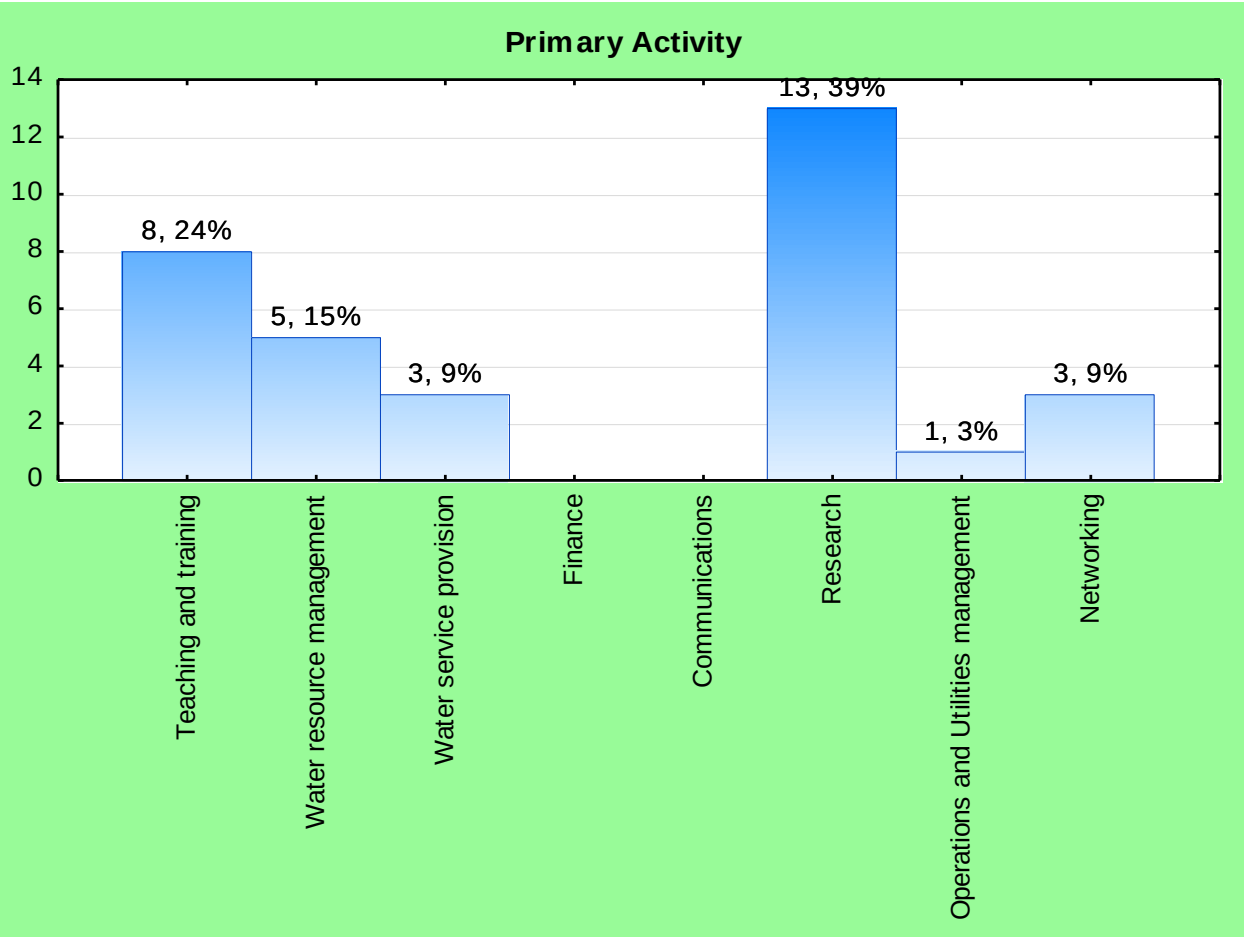


Figure 2 : Primary business where the respondents had only one choice

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 objectives:

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:
- Number of publications
- Publications per researcher
- Share of total publications – whole or fractional counts

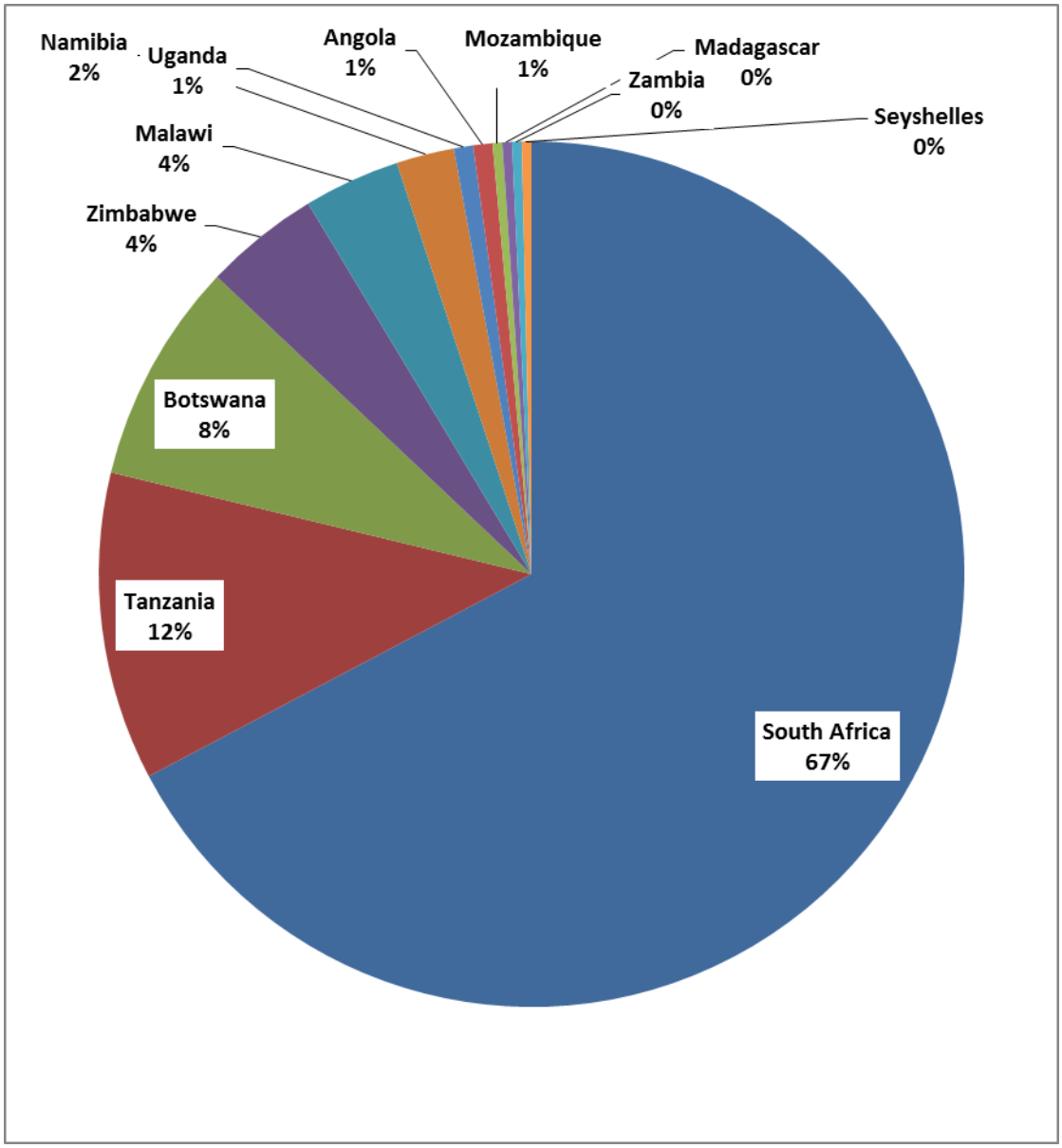
Rationale of the study:
Scopus is a bibliographic database containing abstracts and citations for academic journal articles. Scopus was used to report who is conducting water-related research and development in SADC and in which focus areas (Figure 3 -5). The quantitative survey was done using Scopus 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.



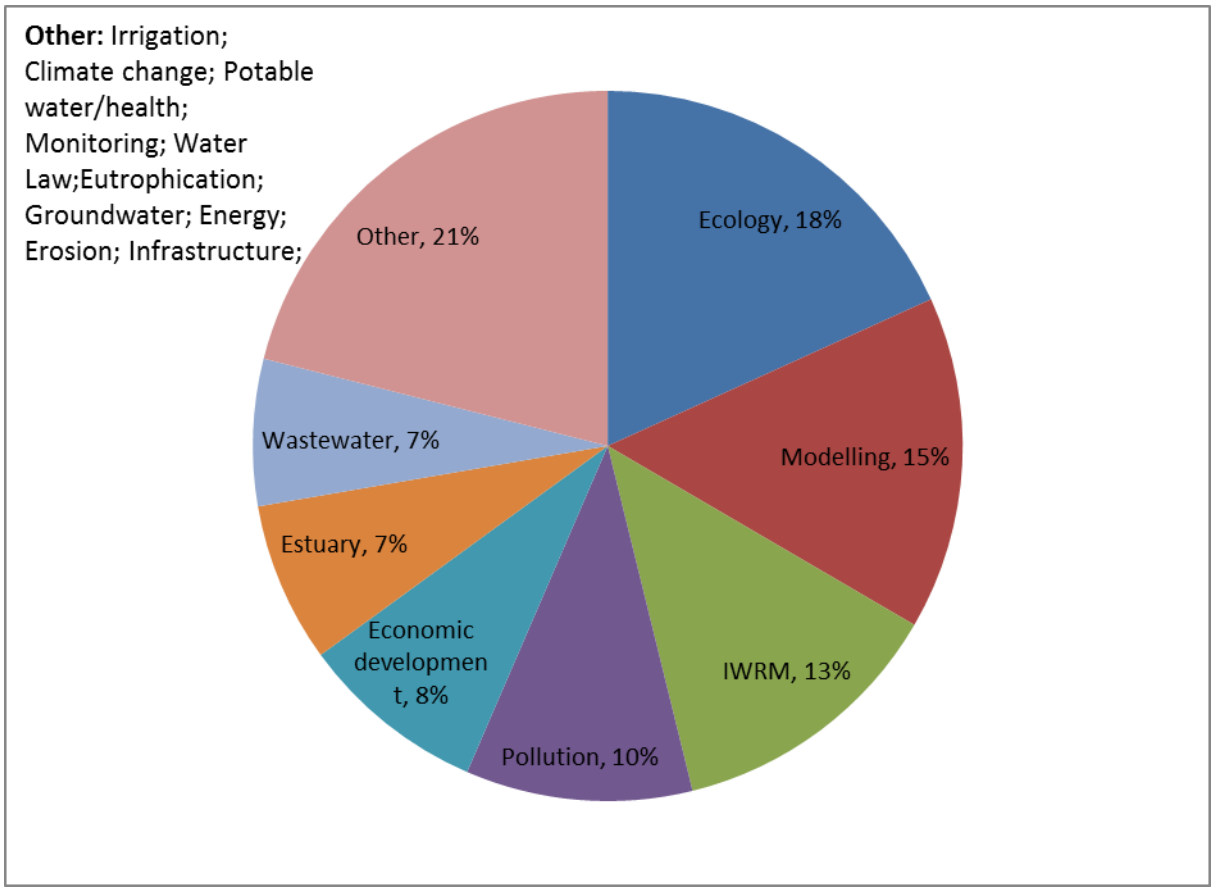
Source: Scopus, 2012

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.



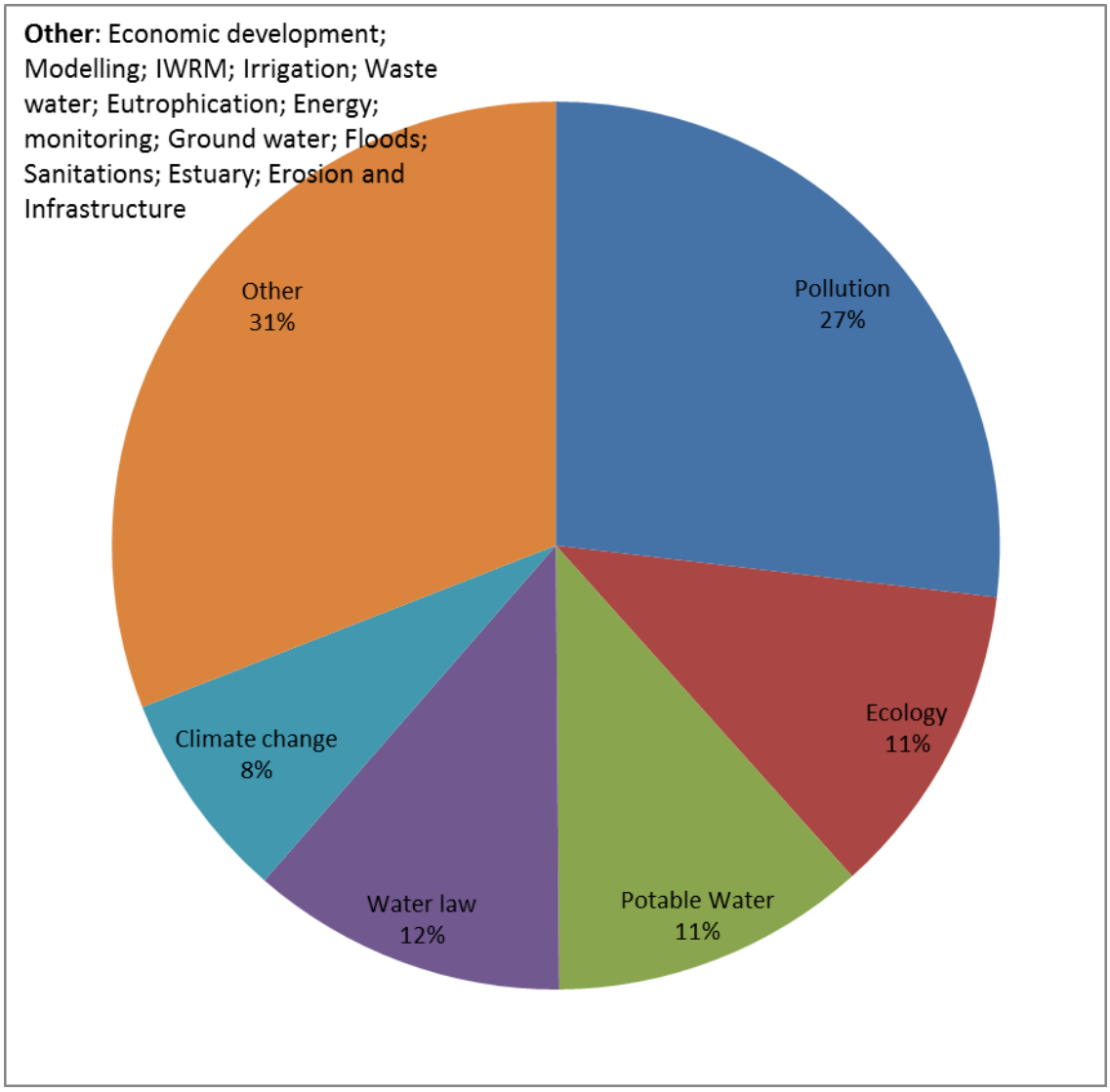
Source: Scopus, 2012

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.

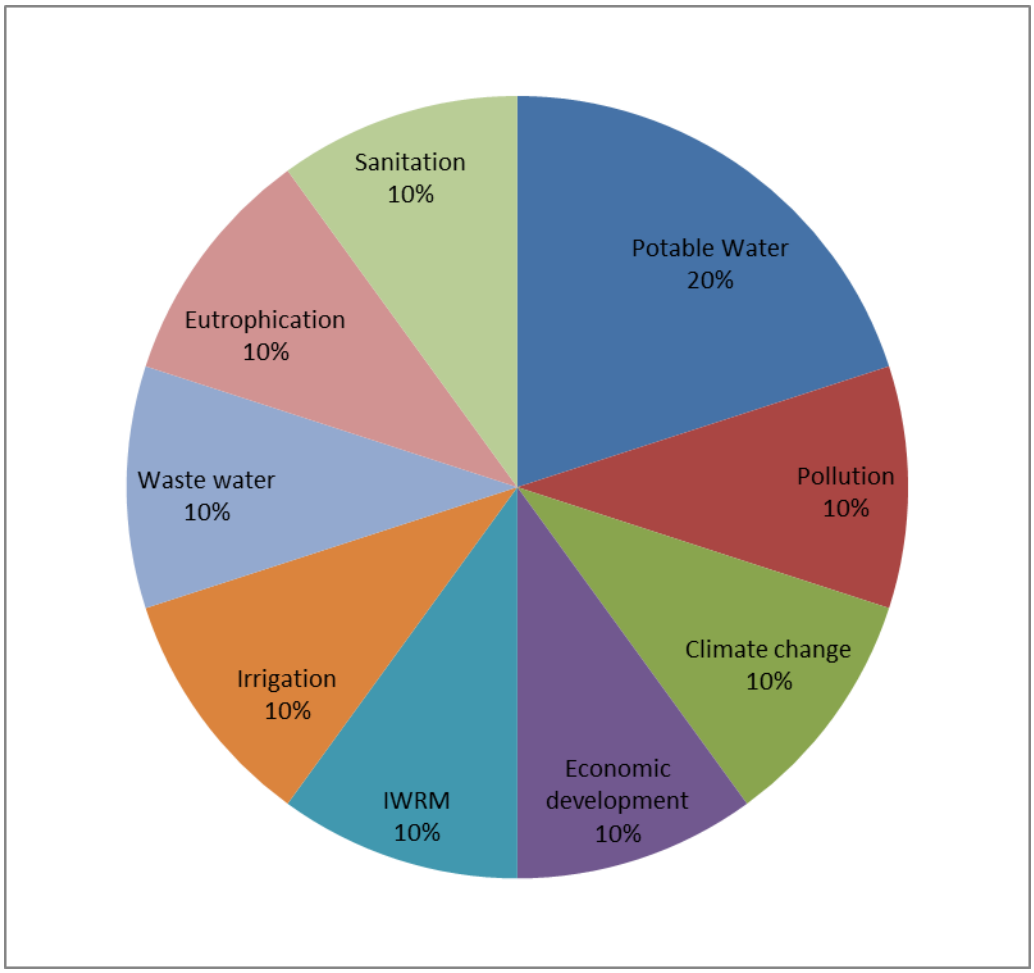


Source: Scopus, 2012

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.



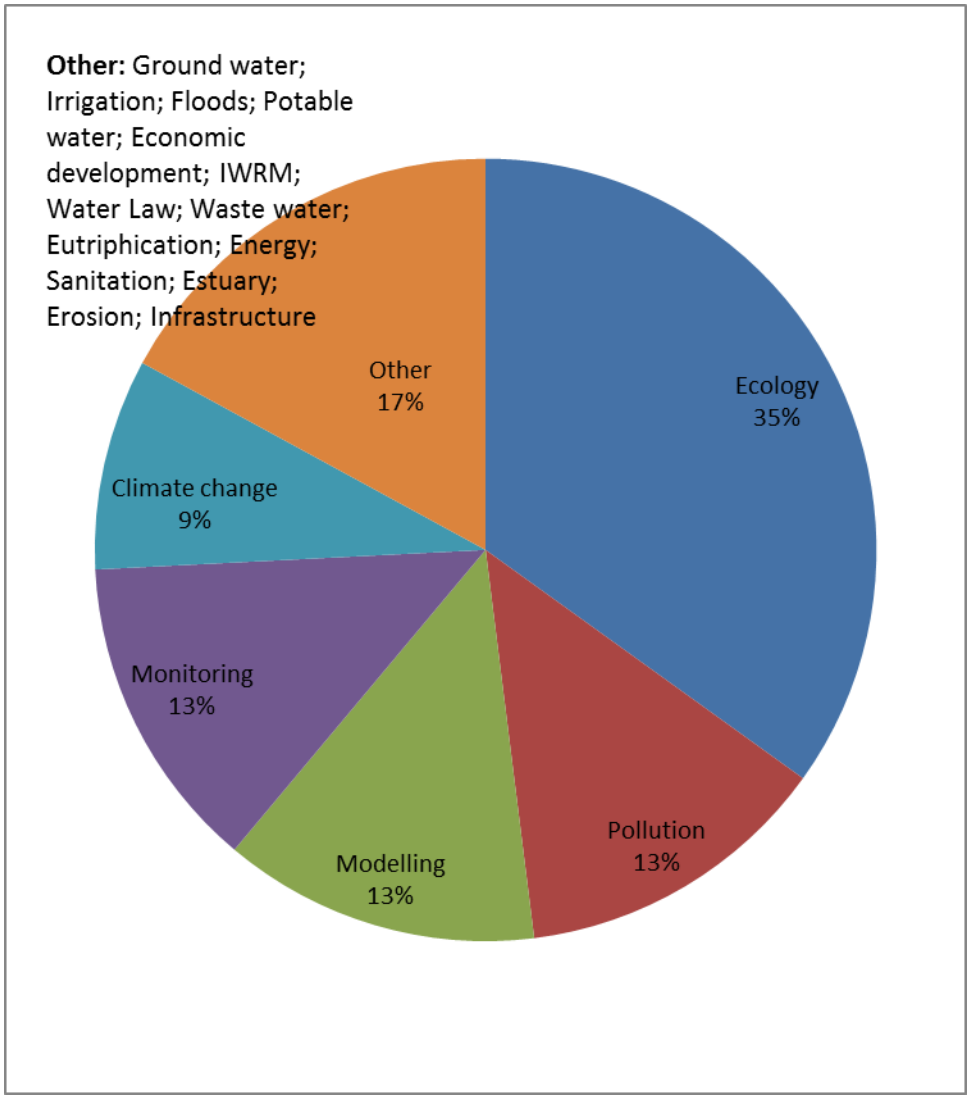
Source: Scopus, 2012

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.



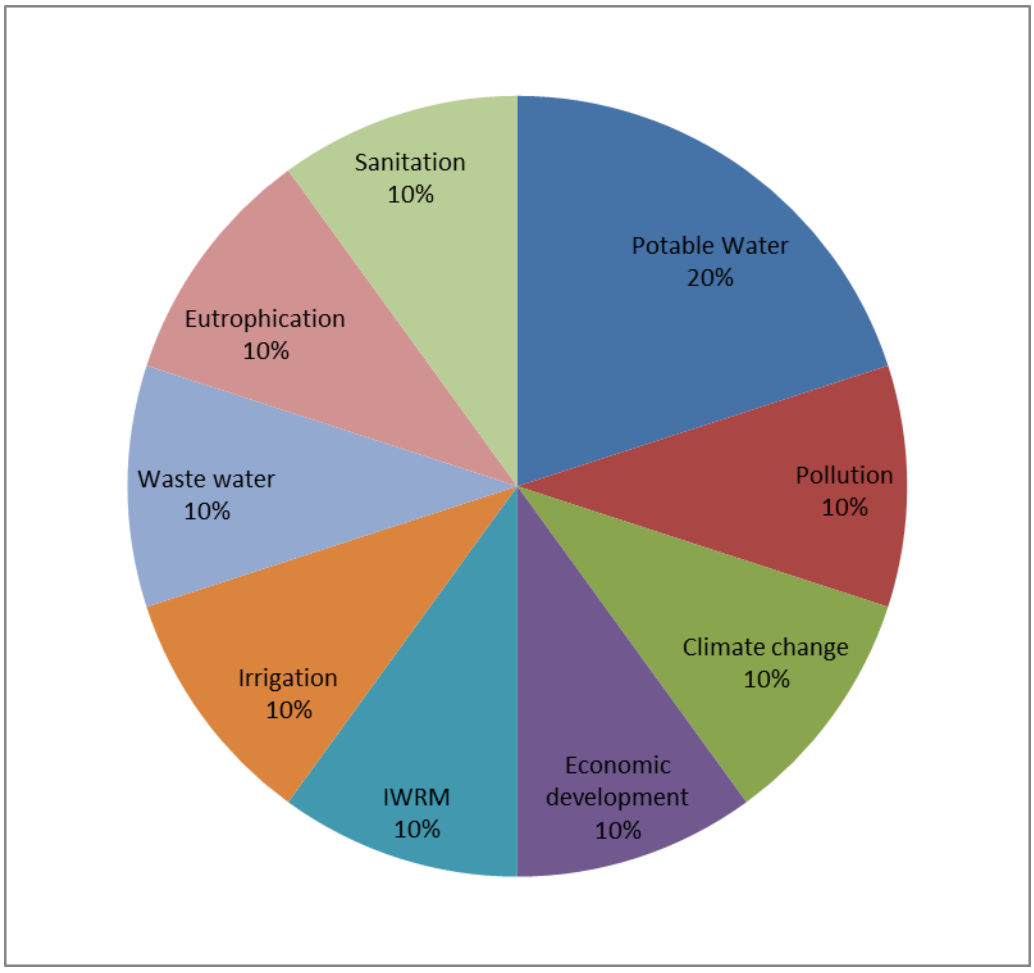
Source: Scopus, 2012

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];
- African Water Association (AfWA);
- EC JRC to Aquaknow.net community 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 known contacts within the NEPAD SANWATCE communication network and who operate within the water sector 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 from 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.

[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.

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 obectives:

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 were accessed, to extract and summarise water-related vacancies in the SADC-Region. These websites and portals include:

a. Predominantly, the web portal 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.
b. In addition, other relevant web-portals were also accessed and analysed[5], as presented in table 5.
c. 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	3. http://www.careerjet.co.za/search/jobs?s=water&l=botswana 4. http://www.wuc.bw/wuc-careers.php
DRC	5. http://www.careerjet.co.za/search/jobs?s=water&l=drc
Lesotho	6. http://www.careerjet.co.za/search/jobs?s=water&l=lesotho
Madagascar	7. http://www.careerjet.co.za/search/jobs?s=water&l=Madagascar

[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).

	8. http://www.emploi-environnement.com/fr/gestion_offre/visu_offre.php4?reference_offre=53197 9. http://www.madagascar-services.biz/emploi-un-technicien-de-laboratoire-un-chercheur-specialiste-en-hydrologie-isotopique/ 10. http://www.actioncontrelafaim.org/fr/content/un-responsable-programmes-eau-assainissement-et-hygiene-hf-0 11. http://www.madagascar-services.biz/emploi-vnu-n2-volontaires-des-nations-unies-unicef/
Malawi	12. http://www.careerjet.co.za/search/jobs?s=water&l=Malawi 13. http://washafrica.wordpress.com/category/countries/southern-africa/malawi/
Mauritius	14. http://www.careerjet.co.za/search/jobs?s=water&l=Mauritius 15. http://gcc.clients.pageup.com.au/jobDetails.asp?sJobIDs=801923&stp=C2&sLanguage=en 16. http://www.afdevinfo.com/htmlreports/org/org_42937.html
Mozambique	17. http://www.careerjet.co.za/search/jobs?s=water&l=mozambique 18. http://www.newjobsinafrica.com/search?q=water 19. http://africaspin.com/openjobs/search/water/page-2
Namibia	20. http://www.careerjet.co.za/search/jobs?s=water&l=Namibia 21. http://www.caglobalint.com/int/jobdetail/3325/0/plant-manager-water-treatment-plant---namibia.htm 22. http://www.namwater.com.na/data/Vacancies_Listings.asp
Seychelles	23. http://www.careerjet.co.za/search/jobs?s=water&l=Seychelles 24. http://iwlearn.net/jobs/water-resource-management-and-project-design-specialist-seychelles-project-undp 25. http://jobsearch.naukri.com/job-listings-Network-Engineer-Water-Sewerage-Seychelles-PUBLIC-UTILITIES-CORPORATION--Seychelles--5-to-10-years-050412001428
South Africa	26. http://www.careerjet.co.za/search/jobs?s=water&l=South+Africa 27. Nelson Mandela Bay 28. http://www.nelsonmandelabay.gov.za/Content.aspx?objID=182 29. http://www.indeed.co.za/jobs?q=Water+Treatment+Plant&l=Pretoria%2C+Gauteng+0083&start=10 30. http://www.veoliawaterst.co.za/search.htm?q=vacancies&w=s 31. http://www.jobvine.co.za/jobs/search/results/?page=4&keyword=water&location=All+Locations&search=both 32. http://www.mosselbay.gov.za/search/2/3/water 33. http://hireresolve.co.za/job_adverts?locations=81,241,240,28,242,33,254,238,239,39&keywords=water

	34. http://www.joblife.co.za/jobs/wastewater_treatment.html 35. http://www.makana.gov.za/index.php?option=com_docman&Itemid=26 36. http://southafricajobsvacancies.com/hydrogeologist-or-water-resources-engineer-job-job-in-gauteng-5304.html 37. http://jobs.mg.co.za/quick_search.php?sel=from_form&from_file=index 38. http://www.andm.gov.za/Municipal_News/Pages/Sanitation-Programmes.aspx 39. http://za.adsdeck.net/jobs/=water-recruitment#
Swaziland	40. http://www.careerjet.co.za/search/jobs?s=water&l=Swaziland
Tanzania	41. http://www.careerjet.co.za/search/jobs?s=water&l=Tanzania 42. 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	43. http://www.careerjet.co.za/search/jobs?s=water&l=Zambia 44. http://www.niras.com/Jobs/JobVacancyOverview/Development-Consulting/Zambia-Water-Sector-Experts.aspx
Zimbabwe	45. http://www.careerjet.co.za/search/jobs?s=water&l=Zimbabwe 46. 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%[6]
ANGOLA	15	1.39%
ZAMBIA	10	0.93%
DRC	7	0.65%
MAURITIUS	6	0.56%
MOZAMBIQUE	6	0.56%
MADAGASCAR	5	0.46%

[6] Note that the research method followed focused on internet published vacancies. Often, employment agencies do publish their vacancies online, but if vacancies were not published online, such vacancies did not form part of the results.

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. Further, it can be concluded that water-sector related vacancies are possibly not pushed through online media in other SADC countries as in the case of 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).

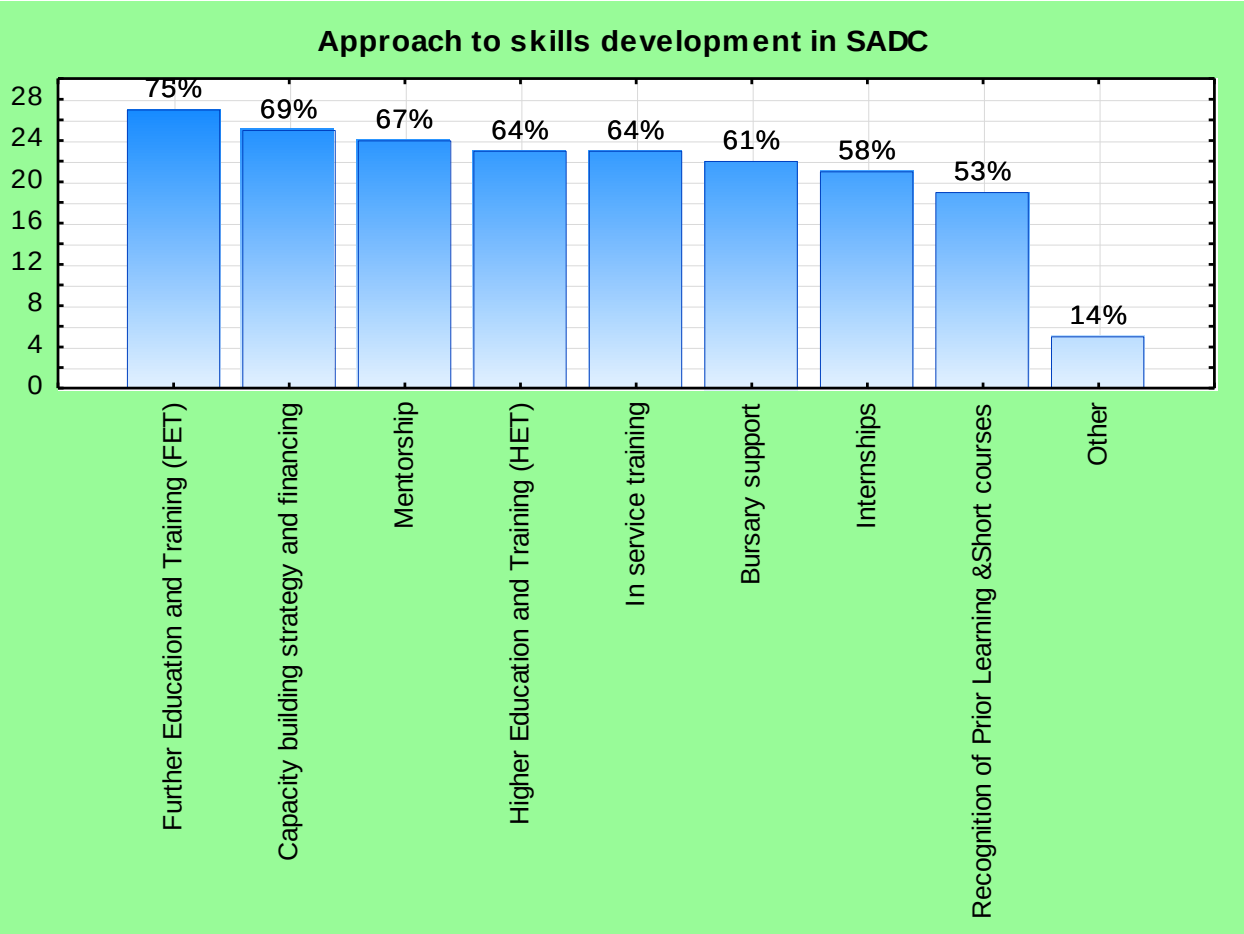


Figure 9 : Approach to skills development in the SADC region

Respondents were asked what SADC's approach is to skills development.[7] 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).

[7] Note that this question was asked to experts from the SADC water-sector during the questionnaire-survey in Phase 1.

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).

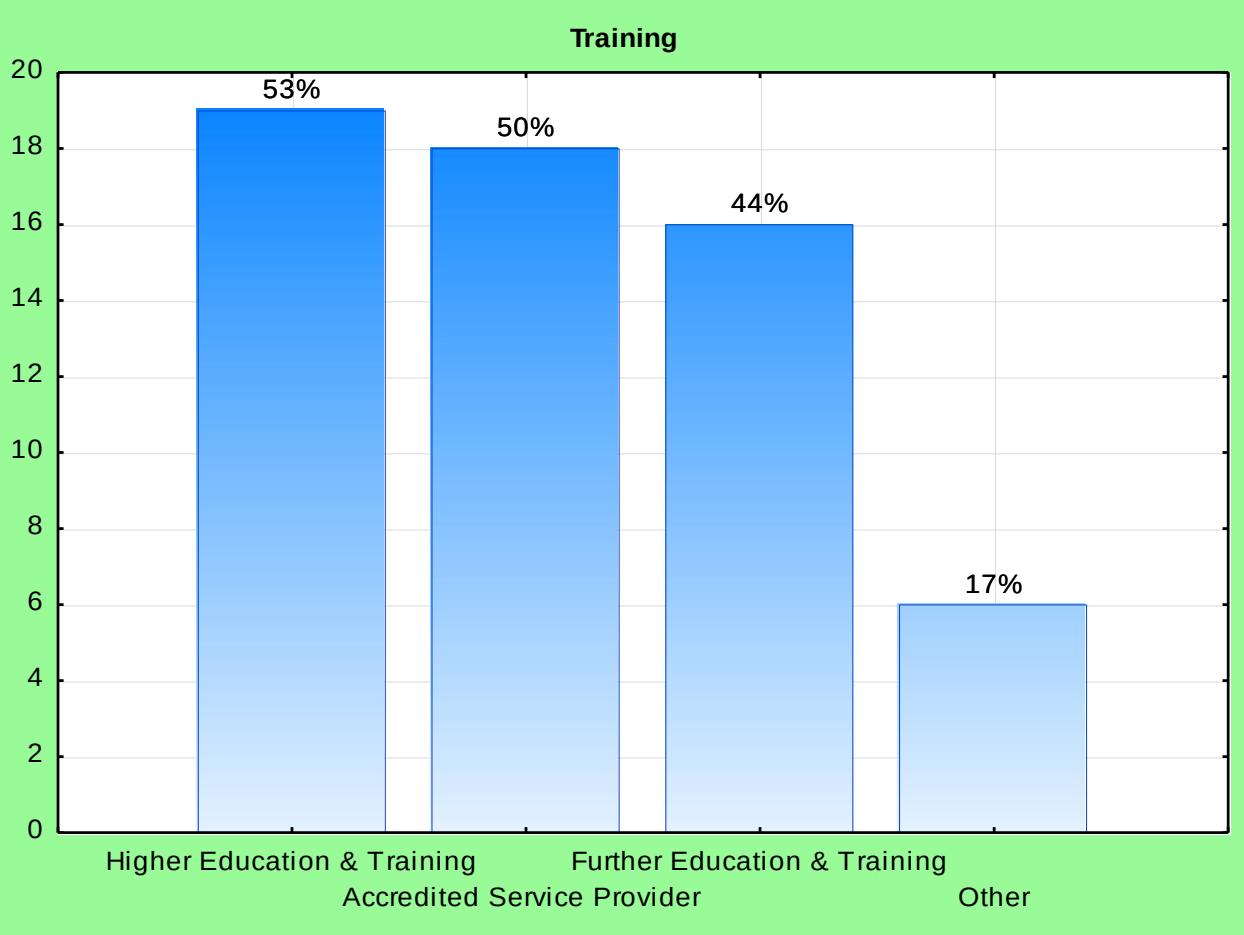


Figure 10: Different types of training

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
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
Waternet offers Short Training Courses, Regional MSc in IWRM.	www.waternetonline.org
GWP SA sponsored short courses	www.gwp.org
Capnet sponsored short courses	www.cap-net.org
Waternet capacity building programme where they offer Masters courses and professional training courses.	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; www.sadc.int/water; 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 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[8] (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

[8] 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).

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	0

		Treatment Operation NQF Level 4	
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	25

		Facilitation (General) NQF Level 4	
		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

i) 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.
ii) 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.
iii) 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.

6. CONCLUSIONS/RECOMMENDATIONS

The assessment of the skills shortages needed to the development of the water sector 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

As the objective of the study as "how the Centres of Excellence could better address sector expertise consultancy and advocacy needed for sector development in the region", it is recommended that 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. Although this indicates a general trend, the results could also be attributed to the research method followed, which focused on on-line published vacancies.
- 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.

There already exist formal degree programmes at many institutions that do this, as well as through accredited short courses and workshops

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. This could be done through establishing a scholarship program.

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. Research outputs and government funding of projects could be used to access the latter.

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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	☐

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	☐	☐

If selected 'other', please specify here.

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

European Commission
EUR 26182– Joint Research Centre – Institute for Environment and Sustainability

Title: NEPAD Southern African Water Centres of Excellence Report on task JLP1.1 and JLP1.2

Author(s): Mannel D., Cloete E., Elema N, Goldin J., Braune E., Leone A., Donin G., Carmona Moreno C.

Luxembourg: Publications Office of the European Union

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