



iWETs

Improving Water Education and Training
skills in South Africa



Improving Water Education and Training skills in South Africa



Vision for Water

Implementing Water Education and Training strategies

Report

This report is the result of research on three interrelated topics: water education, training and skills development, to improve the building of capacity for water management in South Africa and Africa. The report is the result of Phase I of the project, namely, “Vision for Water Capacity Building in South Africa”, and presents an implementation plan proposing 20 projects. The report will be presented and discussed at the WISA 2012 biennial conference.

Client

The client is the DBSA, represented by Ms Jossette Matthee. The project is sponsored by the Dutch government, according to the “Arrangement between the Minister for European Affairs and International Cooperation of the Netherlands”, signed on October 2nd 2011. The Dutch government has given technical support to strengthen the relationship between the Netherlands and South Africa.

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May 15, 2012

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Executive summary

This report covers phase 1 of a broader project entitled 'Vision for water capacity building in South Africa'. Phase 1 brings together research on the three interrelated topics of the water sector, water education and water training and skills development and maps out an implementation plan to improve the building of capacity for water practitioners in South Africa and Africa. The implementation plan sets priorities and offers possible solutions by proposing a number of potential projects involving collaboration with the DBSA (Development Bank of Southern Africa) and sponsored by the Dutch government.

While there has been much analysis of the actual situation in the water sector, along with regulatory frameworks and quality systems, much of **the analyses remain dispersed and fragmented**. This report draws together existing research and makes independent recommendations based on the composite picture emerging from the existing but disparate research into water education, training and skills development. The report starts out by interrogating the range of water institutions and the challenges facing this sector. Following on this, a vision for future water provision is presented. The report then provides an analysis of the educational system, the quality assurance mechanisms and professional registration processes in relation to the needs and demands emanating from the water sector. Finally, professional and international training initiatives are presented, followed by conclusions and a comprehensive set of recommendations in the form of potential projects.

In its overview of water institutions in South Africa, the report outlines the key roles played by the Department of Water Affairs (DWA) and the Water Services Authorities which regulate it, as well as the Water Research Commission (WRC) and professional associations such as the Water Institute of Southern Africa (WISA) and the South African Association of Water Utilities (SAAWU). The challenges facing these water institutions are overwhelming though, with millions of South Africans who have either no access to basic water supply, or access to water that does not meet the basic services standard. This situation arises from a complex set of circumstances of which an important element is the technical skills levels of the staff responsible for the operation and maintenance of treatment plants. There is an **overwhelming need for training** which is exacerbated by a mismatch between qualifications and job requirements. There is **also a lack of collaboration** between the water sector and those institutions responsible for education, training and skills development.

In its vision for the future provision of water in Southern Africa, the report highlights **four interconnected elements** (assets, people, governance and organisations) required to fulfil the water demands in Southern Africa. This vision emphasises the provision of young water professionals who are able to innovate and keep abreast of changes brought about by new technologies, however only a few universities and FET (Further Education and Training) colleges offer qualifications that are able to provide the country with such young water professionals. There are **no dedicated water and sanitation qualifications at levels 2 – 6** of the National Qualifications Framework (NQF), and those generic qualifications that offer some water-related modules do not produce graduates that are readily taken up in the water sector. Currently there are 35 000 staff employed in the South African water sector with a number of vacancies at the 'Technicians and Trade Workers' level, resulting in increased workload for those who are employed. Although there are no figures readily available for the numbers of water practitioners in the sector, lack of compliance with regulatory provisions imply that the sector is not as effective as it should be. The short term challenge for the sector then, is to **train and re-skill employees** to increase performance. At the moment there is no independent organisation offering advice on training possibilities and quality assuring water training.



With a range of career descriptors, occupational groups, career paths and profiles in the water services sector; providing a guide for skills planning, development and tracking is extremely difficult.

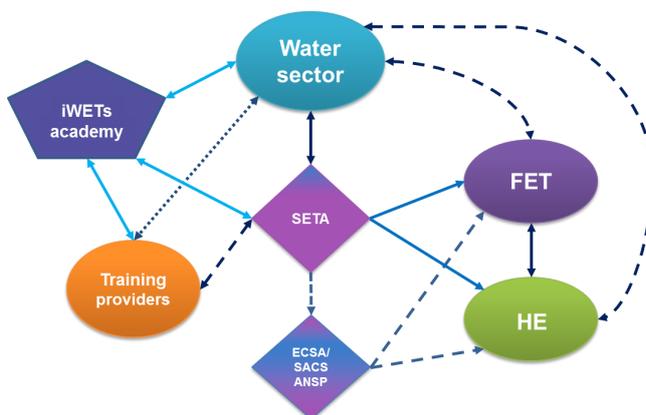


In addition to this, **the planning** for skills development in the water sector, and the education provision available, is **not aligned**. Although the EWSETA (Energy and Water Sector Education and Training Authority) accredits training courses to ensure the quality of learnerships in the water sector, it is clear that the existing needs of the sector are not being addressed by the available courses. For example, there is no unit standard that addresses the need for asset assessment and management of equipment in the water sector, and this against a background of **declining numbers of training services providers**.

The water sector is a relatively young and small sector and the number of water educational opportunities does not meet the demand in South Africa, however there are many professional and **practical training opportunities worldwide**, especially in the Netherlands. It is important that such training opportunities fit the FET/HE system in South Africa as closely as possible to enable potential candidates articulation routes across the NQF. It is also important for international programmes to consider local techniques and practices relevant to the South Africa context. This would require the auditing of international programmes and their customising for South Africa. The report suggests that collaborative projects with international universities could accelerate this process. Such collaborations have also **attracted students to the field of 'water'**, which generally does not attract young adults easily. The other area for international collaboration is the training of staff currently in the system who lack the necessary professional skills to deal with the operation and maintenance of water provision, due to a shortage of quality training providers. Importing quality training courses on relevant water topics could speed up professional competence and the report identifies **WISA** as an organisation which can facilitate the sharing of such knowledge. The report further identifies the Wateropleidingen Institute in the Netherlands as a suitable partner given its professional and practical training experience.



In conclusion the report recommends that the viability of an IWETs (Improving Water Education and Training skills) Academy in South Africa be investigated. Such an academy could coordinate and quality assure specialised courses to address the needs of the water sector. In the short term such an **IWETs Academy** could focus on the development of existing staff and unemployed people, and in the longer term it could focus on the education of future students. In this way better alignment between the water sector and education and training provision can be created through an integrated approach.



The report recommends that the proposed IWETs Academy pays specific attention to improving the role of the water sector and the SETAs in planning and executing skills needs analyses, planning and training provision. Such an academy would also improve collaboration between the water sector, higher education, FET colleges, the regulatory bodies for the engineering and scientific professions, as well as the EWSETA and LGSETA.



1. Introduction

The Development Bank of Southern Africa Limited (hereinafter referred to as the “DBSA”) is a public entity, owned by the South African government, established in 1997 to promote economic development and growth, human resources development, institutional capacity building and the support of development projects and programmes in Southern Africa and the SADC region. According to the research of the DBSA (DBSA&AFD, 2009), the biggest challenges to promote economic growth in South Africa are:

1. Power and energy shortages,
2. Lack of roads and public transport, and
3. Water and sanitation (linked to the national health insurance)

Water and sanitation affects economic development as well as human well-being (health). The DBSA’s vision of alleviating poverty in the region through, inter alia, human resource development, is fulfilled by the accredited DBSA Vulindlela Academy (DBSA VA). Its primary focus is to deliver capacity building to the Local Authorities and SADC Development Financial Institutions. The DBSA VA intends to make interventions in the field of water services covering all human resource capacity challenges in order to provide enough and qualified staff for the water sector.

DBSA VA has requested technical assistance from the Dutch Government to deal with the challenge of Water Education, Training and Skills Development in South Africa. The project, “Vision for Water Capacity



Building in South Africa”, focuses on an implementation plan and to set priorities and to focus on the implementation of possible solutions. The business approach, not for profit, not for loss, of the Dutch Wateropleidingen Institute is considered to be an interesting example for South Africa. So far, the South African government has put a lot of effort in analysing the actual situation in the water sector. The tasks of the institutions are clear and an appropriate number of frameworks, regulations and quality systems are available. As the field of WATER ↔ EDUCATION ↔

TRAINING is extensive, it could easily take several years to conduct profound research and produce yet another analytical report. This report draws together various reports and analyses already available in SA. The independent recommendations are based on what is best for the water sector to meet the challenge of non-sustainable water provision for all households as related to education, training and skills development.

The focus areas in this report are:

- Water: the twenty-four hour provision of water and sanitation,
- Education: scholar system according to the NQF, for pupils and students, and
- Training: on the job and lifelong learning for employees.

The structure of this report follows the sequence:



The water institutions and its challenges will be determined in chapters 2 and 3 and a vision for future water provision will be presented in chapter 4. Chapters 5 and 6 will provide an analysis on the educational system and the quality assurance measures. Chapters 7 and 8 will elaborate on the needs and demands from the water sector and the system of professional registration. In chapters 9, 10 and 11 the professional and international initiatives of training on the job and lifelong learning will be covered. The conclusions in chapter 12 will be followed by recommendations and projects in chapter 13 and 14.

2. Overview of water institutions in South Africa

Water sector institutions

The Department of Water Affairs (DWA) is responsible for the management of water in South Africa. The DWA is reforming as it implements provisions of the National Water Act and has developed strategies to redefine its regulatory and support roles. The regulatory duty of the DWA is divided into two main functions namely, Water Resource Management and Water Services Management. Water Resource Management involves the protection, conservation, collection and management of the raw surface and ground water into dams, while Water Services Management involves the supply of treated water and the re-treatment of used or effluent water, including sanitation services. As the DWA will focus on policy development, regulation and support functions, decentralised bodies will be established, such as Catchment Management Agencies (CMA) and Water User Associations (WUA) which will be responsible primarily for the provision of water resource functions but can also include elements of water services functions.

The South African water sector is regulated by 358 institutions. These institutions can be grouped into 7 categories fulfilling functions which can be divided broadly into two sub sectors, water resources or water services. The institutions are mandated and governed by the National Water Act (NWA) and the Water Services Act.

Water sector Institutions	Number	Water subsector
Department of Water Affairs (DWA)	1	water resource and services
Water Services Authorities	162	water services
Water Boards	14	water services
Catchment Management Agencies (CMA)	9	water resources
Water User Associations (WUA)	165	water services (water resources)
Research Institutions	6	water resources and services
Trans Caledon Tunnel Authority (TCTA)	1	water resources
Other	Unknown	Consulting services firms and others
Total	358	

Table 1: Summary of Water Institutions in South Africa

Water services delivery is performed by a vast number of Water Services Authorities, water boards and their providers across South Africa. These entities are directly or indirectly connected to the local or district municipalities. At a Local Government level South Africa consists of 46 district and 231 local municipalities. These institutions are grouped into 162 water services authorities and they are primarily responsible for the delivery of water services functions. Furthermore eight Metropolitan Municipalities, with no substructures, exist in South Africa.

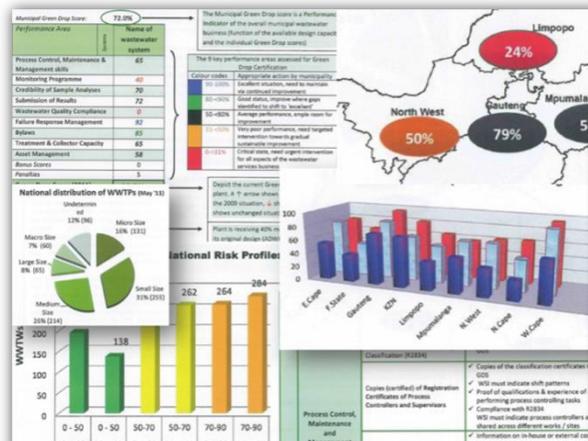
Other associations and institutions in the water sector

The Water Research Commission (WRC) is mandated to coordinate and facilitate research in the water sector and it includes both the water resources and water services areas. Amongst the research topics WRC compiled "Water@work", 2004, an overview of water jobs and careers. The WRC is currently conducting an extensive research project to develop an integrated water sector skills intervention map based on the findings of a quantitative and qualitative sector-wide skills audit.

A number of professional associations and section 21 companies have been established and transformed to be in line with the water legislation since 1990. These associations include, amongst others, the Water Institute of Southern Africa (WISA), the South African Association of Water Utilities (SAAWU) and many others. They often consist of members from the water sector which they represent who play a vital role in the institution landscape of the water sector.

3. Challenges in the South African water sector

Currently 2,4 million people are without access to a basic level of water supply; a further 3,3 million people have access to water supply but the water obtained does not meet the basic services standard. Some reports give even bigger numbers. The South African water sector is required to meet a huge number of challenges. In the rural and agricultural areas the availability of fresh water does not always meet the demand of agriculture and the environment all year round. Furthermore the quality of the water is not always good and is deteriorating in a number of areas. The water provision and sanitation for households is not reliable and sustainable and therefore the quality of life and of education is affected. Economic growth could be stimulated by better provision of water and good sanitation.



Champions in analyses and reports, but failed in action

The actual provision of water and sanitation services is poor, as expressed in the Blue and Green Drop results. The Department of Water (DWA) launched a Blue and Green Drop certification programme. This incentive-based regulatory approach is an effort to ensure that they progressively improve their operations. The proposed system aims at awarding water services authorities with Blue and/or Green Drop Status if they comply with drinking water and wastewater legislation and other best practices required by DWA. The blue drop and green drop awards are used as an indicator for the quality of the water provision. A system is awarded a drop if the system complies with 8 standards, varying from assets to capacitating, to control and operating and maintenance.



Blue Drop	2011
Number of Municipalities assessed	162
Number of water supply system assessed	914
Number of blue drop scores > 50%	536 (59%)
Number of Blue drop awards	66 (7%)
Green drop	2010/2011
Number of Municipalities assessed	156
Number of waste water systems assessed	821
Number of green drop scores > 50%	361 (44%)
Number of Green Drop awards	40 (5%)

Table 2: Blue and Green drop awards in 2010-2011.



The Presidency has revealed that the government will not achieve its target of providing all citizens with water and toilets by 2014.

Hassen Mohamed, a deputy director-general in the Department of Performance, Monitoring and Evaluation in the Presidency, released a report on the status of sanitation at the SA Human Rights Commission's public hearings in Cape Town yesterday. The report, which was ordered by the commission after it ruled on open-air toilets in Cape Town and Viljoenskroon in the Free State, says there are more than 16 million people without basic access to sanitation. It also says 11% of households have no water and toilets, whereas 28% have sanitation services that do not meet set standards.

The report also found that water services authorities were unable to manage existing infrastructure. It will cost the government R13.5-billion to provide basic sanitation services to communities where they do not exist and R31.25-billion to refurbish and upgrade existing infrastructure.

"We are not going to reach the 100% target at the current pace of delivery," said Mohamed. "The issue that is emerging, as we've seen in Makhaza, is that there are services that do not conform to standards in the way we define issues of human dignity, privacy and health." He said the worst-off areas were in KwaZulu-Natal, Eastern Cape, Limpopo and North West.

Source: www.timeslive.co.za/local/2012/03/15

Although encouraging progress has been made with the improvement and compliance of water and waste water treatment facilities with the Blue and Green drop requirements of the Department of Water Affairs, 378 (41% of the total) scored less than 50% of the possible points in the Blue Drop assessments of 2011 and only 66 supply schemes were awarded Blue Drops. Compliance of waste water treatment facilities is even less than the Blue drop assessments, with 56 % of the assessed

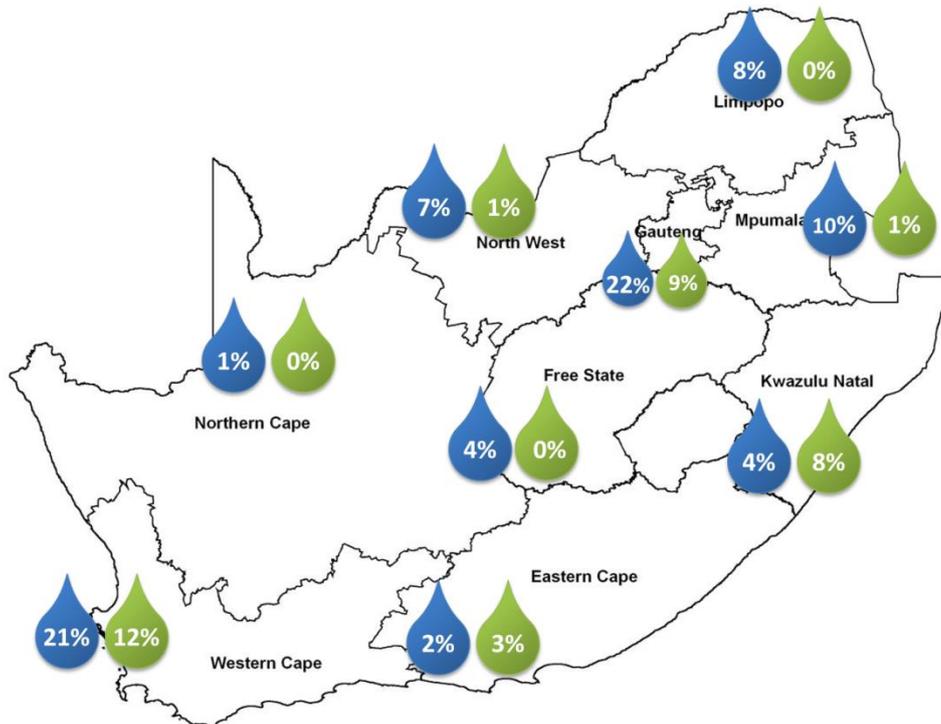


Figure 1: Percentage of Blue and Green drop awarded systems for each province

facilities scoring less than 50% of the total points and only 40 facilities awarded with the Green Drop award in 2011 (Appendix A). Figure 1 shows the percentage of blue and green drop awarded systems for each province. In 2010-2011 only a low percentage of the systems assessed, complied with the requirements and were awarded blue or green drop status.

This situation is the result of a complex set of circumstances but an important element of this is the technical skills levels of the staff responsible for the operation and maintenance of the infrastructure of the treatment plants and the associated infrastructure. Besides the availability of spare parts, successful operation and maintenance is determined by human factors. The responsibility for managing the supply of reliable water to households is shared between the technical staff and the council (political) members. The councillors, the technical portfolio committee (political) members and water managers of the municipalities need to understand the sense of urgency regarding water issues to perform their duties and responsibilities properly. They have to take action to meet the challenges of operating and maintaining public assets. The report on councillor skills profiling (SALGA, 2006) shows an overwhelming need for training, as well as basic and general education, for governing skills and municipal service delivery, strategic planning and project management. The water and sanitation service delivery are serious challenges because of the lack of personnel with practical experience, i.e. skilled process controllers. This is especially evident in municipalities in the rural areas that are not able to appoint skilled process controllers. Generally speaking, there is a mismatch between qualifications and job requirements. Several studies have been executed, which inventory the numbers and skills needed (WRC, WISA).

This project has investigated the relationship and inter-dependencies between people, assets, organizations and governance challenges in the water and educational institutions and how they influence and affect educational, training and skills development for the water sector in South Africa.

Figure 2 depicts the current lack of liaison, communication and collaboration between the water sector and the institutions that are responsible for education, training and skills development. Weak links between the SETAs (EWSETA and LGSETA) and the water sector and training providers are currently evident. Links between the water sector and FET and HE institutions are currently not well established. Furthermore the FET colleges and the HE institutions are not connected.

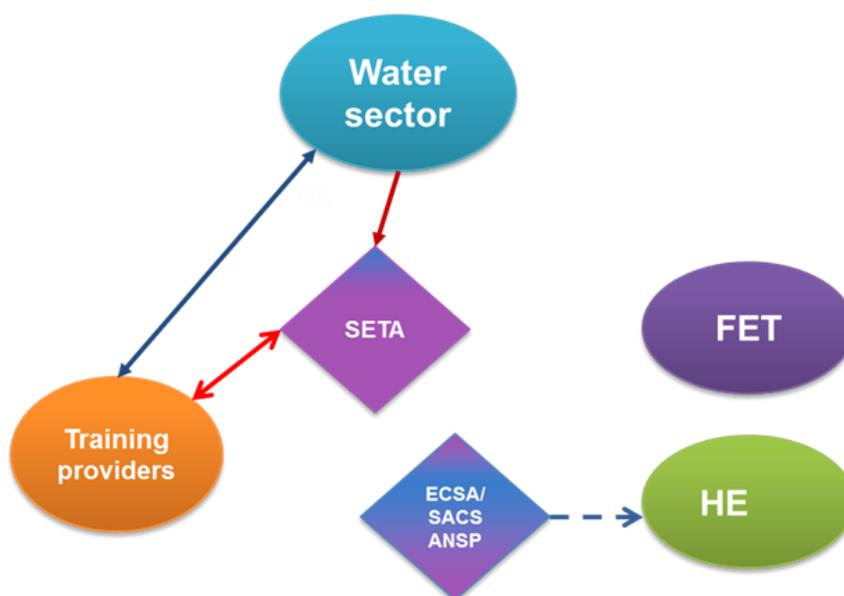


Figure 2: The connection between the water sector institutions and HE and FET institutions

4. Vision on the future provision of water

The vision describes a desirable reference situation for the next 5 to 10 years. It is a vision that enables development and focuses on the actions required to make it a success. Water is a key factor in the development of a prosperous economy, a healthy society and a sustainable natural environment. This implies constant availability of healthy drinking water, collection and treatment of waste water (sanitation) and finally water management to fulfil agricultural (horticultural) and environmental water requirements. These demands are fulfilled by four interconnected elements (see figure 3):

1. A suitable and well-maintained infrastructure of assets (water resource management, drinking water treatment plants, distribution networks, sewerage systems, waste water treatment plants, etc.);
2. Professional governmental and non-governmental organisations being responsible for the delivery and regulation of water services to an appropriate level;
3. An overall-governing structure which provides adequate and suitable policies on water, public health and people empowerment. These policies contain water standards, appropriate legislation, enforcement, education and deal with the financial aspects; and
4. A number of knowledgeable and skilled water professionals, who successfully completed water qualifications from levels 2-7.

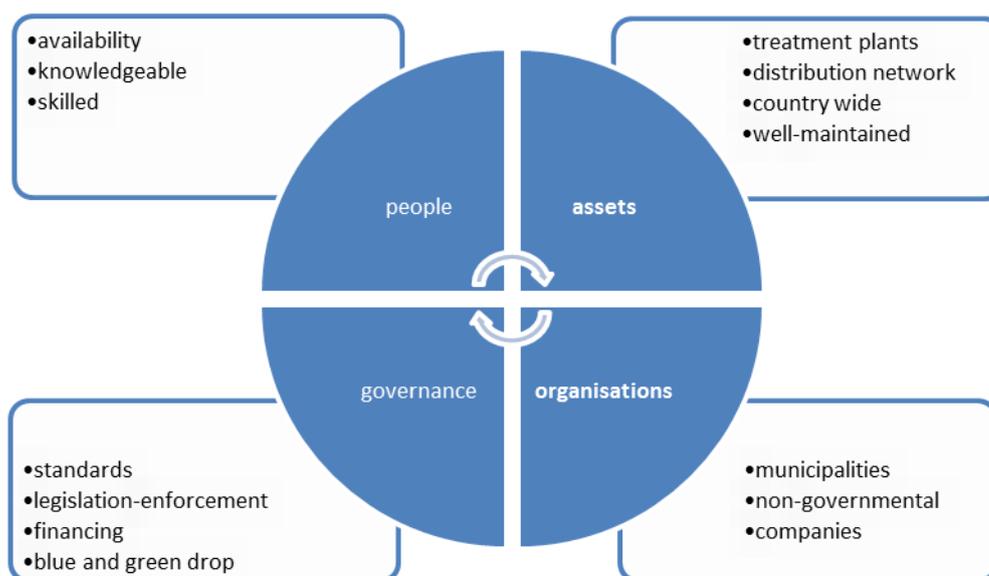


Figure 3: Four interconnected elements to fulfil water demands

Water professionals determine and contribute to the quality of the economy, public health, empowerment and society in this respect. As the first element deals mainly with the hardware, the second and third elements emphasize the software, the human and capacity aspects. A network of certified water capacity building institutions acting under the Higher Education and Training Act will ensure a continuous provision of young water professionals and keep these water professionals abreast of change during their careers. Water professionals have to incorporate innovations and new technologies, so a system of lifelong learning has to be developed, implemented and maintained.

5. The educational pathways of future water practitioners

All South Africans have the right to a basic education, including adult basic education and further education. According to the Bill of Rights of the South African Constitution, the state has an obligation, through reasonable measures, to progressively make this education available and accessible.



The provision of education in SA is well regulated and therefore it is typical to understand why water is not a part of the qualification suite. For a good provision of water education you need a good connection between the 4 elements, while in South Africa most of the effort is put into the assets and in the governance, while the human resource and the water curriculum is neglected.

South Africa's National Qualifications Framework (NQF), a ten level framework recognizes three broad bands of education, namely:

- General Education and Training (primary and secondary schooling),
- Further Education and Training (NQF levels 1-4) and
- Higher Education and Training (NQF levels 5-10).

The higher education and training qualifications are found on the Higher Education Qualifications Framework (HEQF). The HEQF is a sub division of the NQF. The HEQF covers all qualifications from levels 5 to 10. The General Education and Training band will not be discussed in this report.

Qualifications on the HEQF

All South African qualifications are placed on a 10-level National Qualifications Framework (NQF). The envisaged water sector qualifications could include all the qualifications on the HEQF. The HEQF includes all qualifications from level 5 to 10. The table below illustrates all the HEQF-related qualifications with the credits and qualification levels. The list of FET Colleges and Universities and those offering water related programmes are listed in Appendix B and C.

QUALIFICATION TYPES	Minimum Credits at the Level						
	Total	5	6	7	8	9	10
Doctoral	360						360
Masters	180					120	
Post Graduate	120					120	
Bachelor Honours	120				120		
Bachelor (4 yr. degree)	480				120		
Bachelor (3 yr. degree)	360			120			
Advanced Diploma	120			120			
Diploma	360		120				
Advanced Certificate	120		120				
Higher Certificate	120	120					

Table 3: Qualifications on the HEQF

Progression Possibilities: Formal Education Route

Figure 4, on the following page, shows the articulation possibilities of the HEQF. The minimum entry requirement is the National Senior Certificate from a high (secondary) school with appropriate subject combinations and levels of achievement. The National Certificate Vocation level 4, offered at Further Education Training (FET) colleges, also serves as a minimum entry requirement.

The Advanced Certificate follows on from the Higher Certificate. The Diploma, a level 6 and a three-year qualification articulates into the Advanced Diploma. The Advanced Diploma could articulate into a three-year degree or a professional degree. The articulation rules will depend on the provider. The minimum entry requirement for degree qualifications is the National Senior Certificate, from a high school, with matriculation exemption and appropriate subject combinations as defined in the Ministerial policy on Minimum Admission Requirements for Higher Certificate and Diploma Programmes Requiring a National Senior Certificate (Government Gazette, Vol. 482, No. 27961, 18 August 2005).

The three-year degree is followed by an honours degree, followed by a master’s degree and then onto a PhD degree. The four-year degree articulates into a master’s degree and the master’s degree articulates into a PhD.

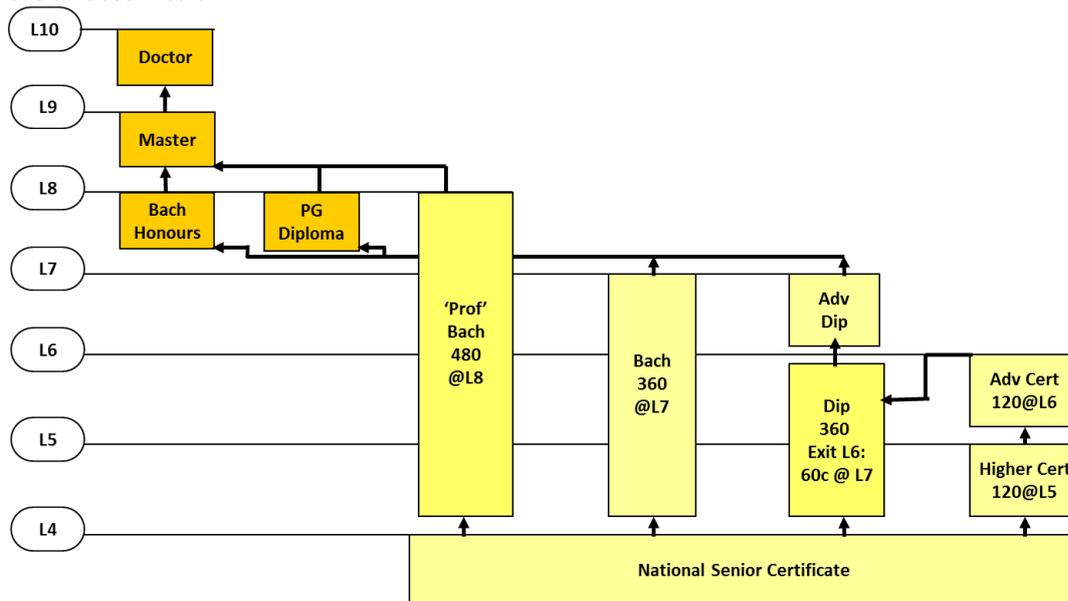


Figure 4: HEQF progression model

Only a few Universities and FET colleges offer formal qualifications in water. The numbers of students are low. The challenge is to develop formal qualifications for the FET Colleges. In addition to formal programmes some universities offer courses and non-formal programmes; listed in appendix C. The numbers provided in table 4 represent the number of enrolled students, which does not guarantee that they will complete the courses.

University	Qualifications in Water	Average number of students
University of Cape Town	Post-graduate diploma in Water Quality (1 year fulltime, or 1 year part-time) Masters in Engineering in Water Quality Engineering MSc (Eng) and MSc (Applied Science) PhD	12
University of Zululand	Hydrology	8
Rhodes University	Hydrological Studies	5
University of Pretoria	Honours degree in Water utilisation (2yr part-time or 1 yr. fulltime)	10-15
Tshwane University of Technology (TUT)	Under-graduate qualifications in water and waste water treatment. M and D Tech degrees in water technology	30 (BTech) 40 (N diploma)
Other Universities of Technology	Civil Engineering Bachelor of Technology Degrees in Water	200

(Source: personal communications)

FET	Water Reticulation NQF Level 2, Waste Water Reticulation NQF Level 2	106 108
FET	Water Treatment Operation NQF Level 2, 3 Waste Water Treatment Operation NQF Level 2	420 233
FET	Community Water, Health, Hygiene & Sanitation Promotion (General) NQF Level 4 Community Water, Health, Hygiene & Sanitation Promotion (O&M) NQF Level 4 Community Water, Health, Hygiene & Sanitation Facilitation NQF Level 4	25 60 100

Table 4: Water qualifications at Higher Education (HE) institutions and FET colleges

(Source: EWSETA SSP2011-2016)

There are no dedicated water and sanitation qualifications at levels 2 to 6. Graduates from the FET/HE system are often not employed in the water sector because of generic qualifications. When water education is considered in the FET/HE system there are several challenges:

- FET colleges and universities do not offer dedicated curricula in water education,
- curricula are poorly designed and do not meet the demand and the needs of the water sectors,
- curricula do not assist in the career paths for water practitioners,
- teachers are not knowledgeable in water education,
- students lack β -knowledge at level 10, and
- the number of students registering for curricula with a water focus is not meeting the future needs. The water sector seems to be a bit invisible and less attractive to students.

6. Accreditation of Water Education Qualifications

The South African Council on Higher Education (CHE) and Umalusi are responsible for the accreditation and quality assurance of qualifications in South Africa. The CHE is responsible for all qualifications from levels 5 to 10 and Umalusi is responsible for qualifications from levels 1 to 4.

The South African Council on Higher Education is an independent statutory body established by the Higher Education Act, No. 101 of 1997. The CHE advises the Minister of Higher Education and Training on all higher education issues and is responsible for quality assurance and promotion through the Higher Education Quality Committee (HEQC).

The Umalusi Council sets and monitors standards for general and further education and training in South Africa in accordance with the General and Further Education and Training Quality Assurance Act, 2001. Umalusi is currently responsible for the certification of the following qualifications in General and Further Education and Training:

- Senior Certificate (SC) - to be phased out by 2011
- National Senior Certificate (NSC) - Commenced 2008
- National Technical Certificate (N3) - Phasing Out
- National Senior Certificate (Vocational) - Commenced 2008
- National Certificate Vocational (NCV) - Commenced 2007
- General Education Training Certificate : Adults (GETC)

In order to issue learners with certificates that are credible, Umalusi evaluates qualifications and curricula to ensure that they are of the expected standard:

- Moderates assessment to ensure that it is fair, valid and reliable
- Conducts research to ensure educational quality
- Accredits educational and assessment providers
- Verifies the authenticity of certificates

The different levels and Accreditation Authorities are shown in the table below.

NATIONAL QUALIFICATIONS FRAMEWORK				
Doctoral Degrees		Level 10	CHE-HEQC	HEQF
Masters Degrees		Level 9		
Post Graduate Diplomas		Level 8		
Honours Degrees				
Professional Degrees				
Bachelor Degrees		Level 7		
Advanced Diplomas				
Diploma		Level 6	UMALUSI	GETQF
Advanced Certificate				
Higher Certificate		Level 5		
National Senior Certificate (Grade 12)	National Certificate (Vocation) 4	Level 4		
Units of learning to be accumulated	National Certificate (Vocation) 3	Level 3		
	National Certificate (Vocation) 2	Level 2		
General Education and Training Certificate (Grade 9)	General Education and Training Certificate (Grade 9)	Level 1		

Table 5: NQF levels and accreditation authorities

7. Water practitioners: Actual water services staff

The South African water sector employs approximately 35,000 staff, of whom 50% work at municipal level (source: EWSETA SSP report 2011). The other 50% works at the Department of Public Works and private companies, mines, utility companies. The total numbers vary depending on which references are used and can range from between 28,500 and 35,000. Employment in the water sub sector is characterised as follows:

- Just over 22% of employees in the sector are in the Western Cape, followed by the Eastern Cape with 17% and KwaZulu-Natal with just under 14%. The province with the least employees in the sector is Mpumalanga at just over 3%, followed by Limpopo at about 9%.
- 79% of workers in the sector are above 35 years of age.
- Younger employees, less than 35 years of age, are mostly concentrated in elementary occupations.
- About 67% of employment in the sector is still at the lower-end plant and machine operator and elementary occupations.
- About 62% of the employees are male.
- 70% of the employees are black.
- 38% of black employees have educational levels below Grade 9 with only 12% having a post-matric qualification such as a diploma or a certificate.

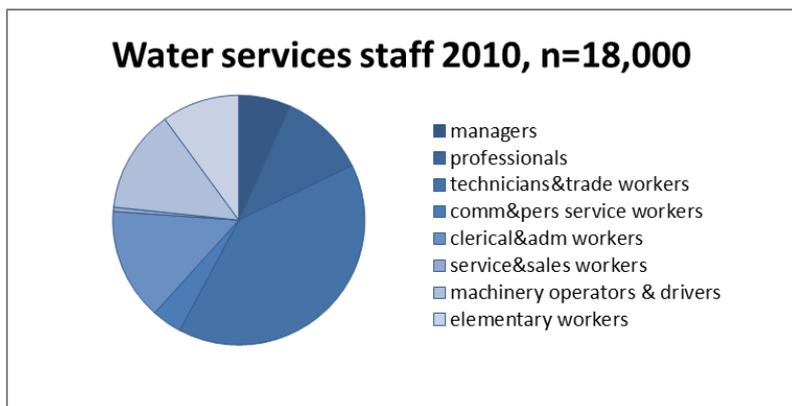


Figure 5: Water occupations at municipalities (source: EWSETA SSP 2011-2016)

About 900 vacancies (20%) were inventoried. The majority of the vacancy rates were found at the 'Technicians and Trade Workers' category level (46%), followed by the 'Professionals' level (20%) and lastly the 'Elementary Workers' level (12%). The age profile for the Water sector is not available, but it is expected to be equal to or higher than the energy sector (figure 6).

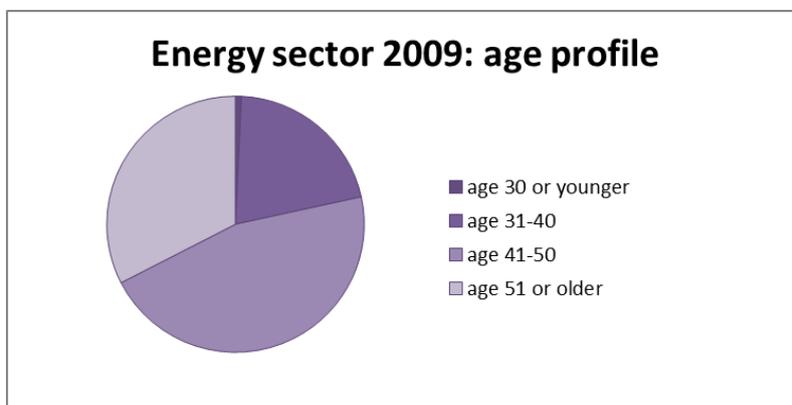


Figure 6: Age profile of the energy sector staff (source: EWSETA SSP 2011-2016)

Water staff in municipalities

The number of water and sanitation staff in District and Local municipalities is reflected in Figure 7 and Figure 8. These figures show that the majority of municipalities have fewer than 20 dedicated water and sanitation staff. Thus a small turnover of staff or vacant posts in the water and sanitation units means that workload will have a significant impact on those institutions and also on fulfilling the functions of the municipality.

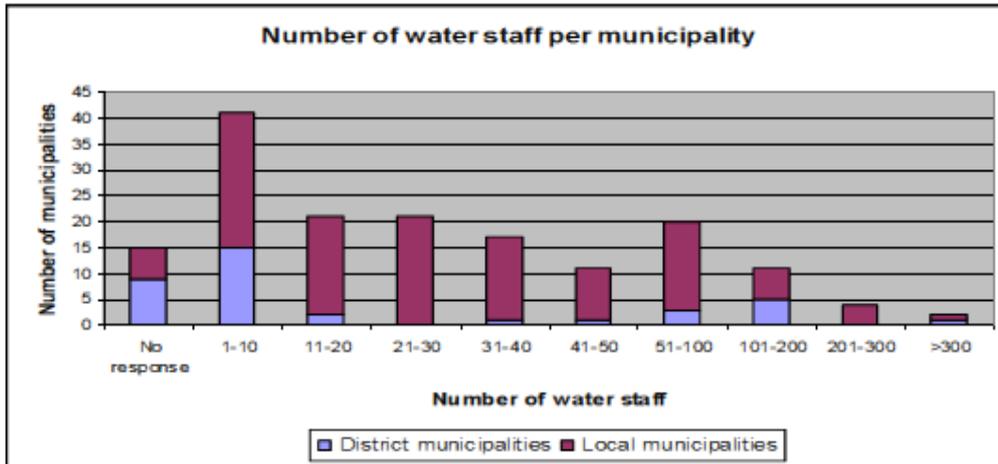


Figure 7: Water staff employed in Municipalities (source: EWSETA SSP 2011-2016)

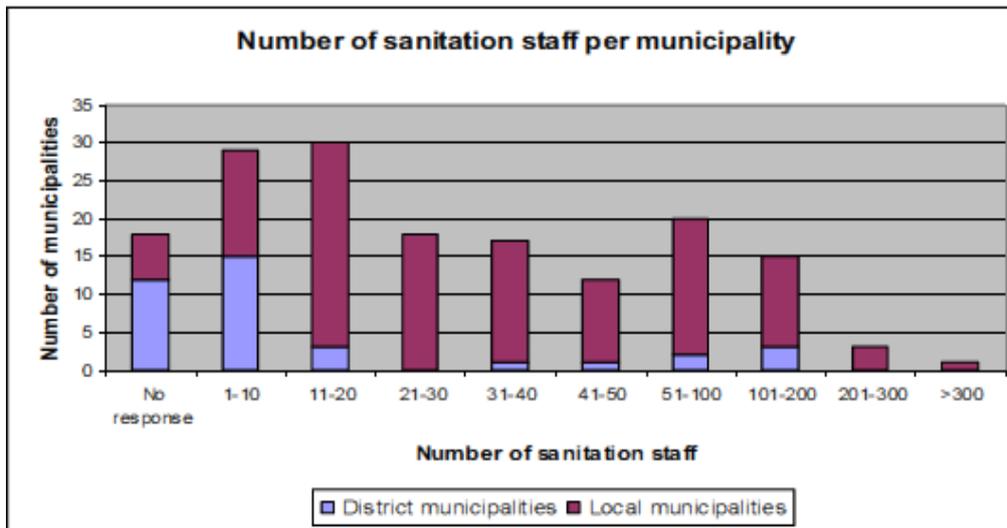


Figure 8: Waste water staff employed in Municipalities (source: EWSETA SSP 2011-2016)

Other Water staff

Besides municipalities, state-owned companies e.g. Eskom and Transnet Professional Service Providers, and consulting engineering firms employ a significant number of professional and other technical staff members fulfilling water supply and water treatment related services. More than 850 consulting engineering companies are listed with the Consulting Engineers of South Africa (CESA).

DWA and government departments are employing staff responsible for water-related functions. This includes amongst others, the Department of Public Works who is responsible for more than 1 500 water and waste water facilities across the country, located at hospitals, police stations, correctional facilities and border posts. Privately operated package treatment plants for new housing developments also require operators and process controllers in the private sector to manage in

accordance with regulations. A number of other Water Utility companies (other than Water Boards) also require skilled technical staff to perform the functions required. This includes amongst others ERWAT (East Rand Water Care Company).

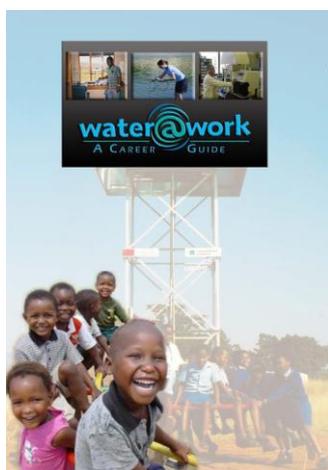
Although no quantification of the exact number of water practitioners is available, some proxy indicators can be used to assess the effectiveness of the water sector. The Blue and Green drop programme of the DWA provides some insight into the ability of Water Service Authorities and Local Municipalities to comply with the required regulatory provisions. Nationally, 914 supply systems and 821 waste water treatment systems are operated. Each system needs to be operated and maintained.

Actual statistics on occupational profiles and the number of employees needing training is not available. The short term challenge for the water sector is to train and re-skill employees to increase performance. Vacant posts have to be filled by employing non-qualified people. They must be trained on the job and they need appropriate training that leads to a professional qualification. At the moment there is no independent organization offering advice on training possibilities and quality assuring water training.

8. Water practitioners: The demand and the needs

Quantity of water staff needed

The list of occupations applicable to the water sector varies greatly depending on which reference or guideline report is used. A substantial number of the water applicable occupations is not listed as Organizational Framework for Occupations (OFO) and therefore have not been assigned an OFO code. The WRC career guideline lists at least 26 areas of specialization in the water sector and the WRC report TT 306/07 lists at least another 18 areas of specialization. The report, compiled by the WSLG Skills Development Task Team, pointed to and identified key focus areas in response to the demand for skills in the Water Services sector. These career descriptors, occupational groups, career paths and career profiles make the planning, skills development and the tracking of skills extremely difficult.



1. Civil Engineers	10. Economists
2. Biochemists	11. Hydraulic Specialists
3. Chemical Engineers	12. Lawyers
4. Analytical Chemists	13. Microbiologists
5. Electrical Engineers	14. Health Promotion Officers
6. Limnologists	15. Construction Project Managers
7. Mechanical Engineers	16. Engineer Managers
8. Environmental Health Practitioners	17. Technical Project Managers
9. Hydrologists	18. Artisans
	19. Technicians

Table 6: List of key demand for skills in the water sector (WRC, 2004)

Quality of water staff needed

The methods used to quantify education, training and skills requirements are not adequately developed and refined to provide a definite guide for skills planning. The Water sector needs are often lumped together with the energy and gas sector, making it impossible to distinguish and quantify the needs for the subdivision of the water sector.

Municipalities have a growing demand for service delivery, but remain unable to meet the demand for multiple reasons, including poor skills levels, unavailable technologies, and labour force dynamics. The public and private sector, consisting of more than 358 organizations, is diverse and the associated occupational groups require skills at all levels, from general workers and artisans, to scientists and engineers. The planning for the skills required and the education provision available is not aligned and as a result various disconnections manifest themselves in the water sector.

Actual statistics on occupational profiles and the number of employees needing training are not available. The short term challenge for the water sector is to train and re-skill employees to increase performance.

Due to an expected economic growth potential in South Africa and the policies already in place to improve water services, the number of vacancies will increase, as well as the level at which performance will be required.

EW and LG SETA

There are 21 Sector Education and Training Authorities (SETAs) in South Africa. The Energy and Water Sector Education and Training Authority (EWSETA) are a skills development authority responsible for skills development within the energy and water services sector. Launched in 2000, in terms of the Skills Development Act of 1998, EWSETA has the mandate to manage the skills development needs of the energy and water sector through strategic sector skills planning within the framework of the National Skills Development Strategy. The EWSETA also encourages skills development. This is done through the establishment of a system of levies and grants (levies for skills development, payable in terms of the Skills Development Levies Act) to implement its Sector Skills Plan. This encompasses the following:

- establishing learnerships;
- approving workplace skills plans;
- allocating grants to employers;
- education and training provision and workers; and
- monitoring education and training in the sector.

The SETA for the energy sector was extended in 2005 with the 'water services' subsector and the EWSETA was created. The inclusion of water services in the energy sector is in part recognition of the intimate relationship between the energy and water economic sectors. The Local government SETA (LGSETA) is closely associated with the EWSETA and has skills development planning and implementation responsibility towards the broader Local Government institutions. Skills development levies (SDL) are paid to the SETA to provide partial funding for the execution of its functions. A total of 576 companies were registered in the electricity, gas and water sectors for 2006-2009. Only slightly more than half of the numbers of registered companies in the electricity, gas and water sector paid the SDL in 2008/09. The companies in the electricity, gas and water sector contributed only 0.2% to the total SDL in 2009.

The EWSETA accredits training courses and the providers of the training courses, to ensure the quality of the learnerships that are offered is compliant with the needs of the water sector and associated industries. If the diversity of the training courses that are accredited with the EWSETA is considered, then it is clear that the existing needs cannot be addressed with the courses that are accredited. This is possibly related to the lack of unit standards according to which training courses must be compiled and presented. No unit standard, that particularly addresses the need for asset assessment and management of equipment in the water sector, exists.

The number of training services providers has also declined over the past number of years and the current list of training providers is most likely not applicable any longer. This situation has most likely contributed to the proliferation of ad hoc training interventions and short courses that are offered in the water sector, which are presented without alignment with units standards.

Case study for the Western Cape and extrapolation to the whole country

The Western Cape consists of 5 districts and 25 local municipalities. During 2010 the LGSETA made funding available for the training of process control staff employed by the local municipalities. A private service provider was appointed to undertake the training and as part of the assignment an analysis was conducted amongst the process control staff of these municipalities. From the analysis it became evident that approximately 15 – 20% of the posts for process controllers were vacant, and about 5 % of the staff were recommended for Adult Basic Education and Training (ABET).

No clear correlation could be quantified for the compliance with Blue and Green drop requirements and the skills levels and vacant posts in the local municipalities. The lack of a correlation can be ascribed to the support a number of local municipalities receive from external service providers which would obscure the performance and ability of the internal staff in the local municipalities.

The Western Cape has achieved substantially better results than the rest of South Africa and the need for the improvement of training and skills development cannot be over emphasized.

These types of training interventions provide an ideal opportunity for the water sector to initiate a detailed analysis of the situation with regard to process controllers and to enable the planning of medium to long term interventions and the tracking of the success of the interventions for the training required. The Water Institute of Southern Africa has taken the lead with initiating a process controller division in 2012 and this will assist in the professionalization of the essential occupation group.

The DWA is in the process of establishing regulation 17 to assist with the formalization of the minimum qualifications and requirements to which a process controller must comply in order to manage a particular treatment facility in terms of its complexity and size.

Although the situation of process controllers is becoming better known to the water sector, a number of other areas in which skills are required, are being neglected. If these skills requirements are analysed, it might reveal similar shortages of skills. This includes, but is not limited to, various elements related to water resource management and water use licensing.

9. Professional engineering and scientific registration of water occupations

All tertiary-related water engineering qualifications are accredited for registration purposes by the Engineering Council of South Africa (ECSA).

The ECSA accreditation process has common policies and procedures for accrediting the various types of engineering education programmes: BEng-type, BTech, National Diploma and Certificate. Each type of programme has a separate standard that specifies the main structural requirements and the outcomes to be produced.

The registration process requires a candidate to meet both an educational and a practical requirement in order to meet registration standards. The educational requirements (Stage 1) and the practical requirements (Stage 2) for professional registration are shown in the figure below.

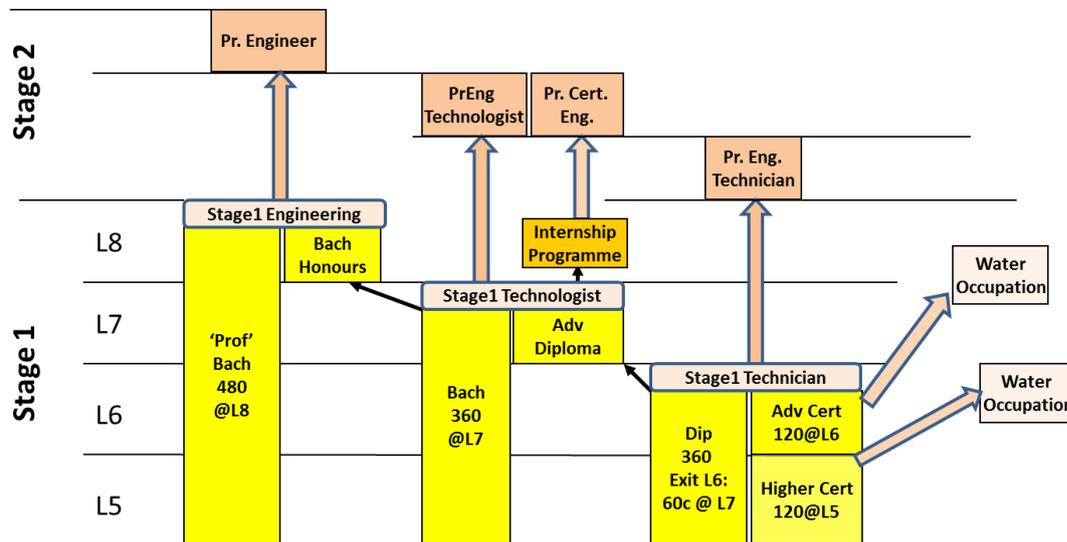


Figure 9: Professional registration model for water-related practitioners

The Advanced Certificate and the Diploma are the minimum educational requirements for registration as a Professional Technician. The three-year Degree and the Advanced Diploma are the educational requirements for registration as a professional technologist, as well as a professional certificated engineer. Likewise the four-year Degree is the educational requirement for registration as a Professional Engineer. The Advanced Diploma is also the educational requirement for the Professional Certificated Engineer registration. The educational requirements for specialization are the Higher and Advanced Certificates. These qualifications are designed so that at least 50% of the credits could be linked to a specific occupation and in this case it is water-related occupations.

Continuing professional development (CPD)

CPD is the system to ensure that professionals maintain their competence and knowledge in their areas of expertise. Due to the Engineering Profession Act, 2000 (Act No. 46 of 2000), engineers must have a professional registration and they have to work on their professionalism throughout a career. The companies prefer registered staff members and do not appoint non-registered staff members. To become registered and to maintain the registration status, professionals have to gather credit points (CDP).

CPD points can be obtained by different types of activities:

- Attendance of structured educational/developmental meetings like seminars, refresher courses etc.;
- Working experience by performing day-to-day engineering responsibilities and mentoring of candidate practitioners; and
- Individual activities, like membership of a recognized voluntary associations, lecturing and publication.

Scientific registration

The South African Council for Natural Scientific Professions (SACNASP) is the legislated regulatory body for natural science practitioners in South Africa. The natural sciences encompass a wide range of scientific fields covering all of the basic sciences and many of their applied derivatives. The fields of practice include 18 (of 30) fields with Aquatic science and the more recently added field of Water Resources Science which is directly related to water. The table below provides an overview of the number of registrations per category. It is important to note that a relatively small percentage of the registrations are directly related to water science. The ideal relation between all registrations and water science registration is not known.

Registration category	Number of registrations	Water Resources science	Aquatic science
Candidate Natural Scientist	311	7	6
Certified Natural Scientists Level A	274	11	22
Certified Natural Scientists Level B	13	1	1
Professional Natural Scientist	4 362	30	16
Professional Engineer	14 696		
Professional Engineering Technologist	3 702		
Professional Certificated Engineer	1 036		
Professional Engineering Technician	3 519		

Table 7: Scientifically and professional registered water practitioners (source ECSA annual report 2010/2011)

10. Continued professional development and lifelong learning

The days are long gone when initial qualifications and certification were seen as final preparation for a career. Today diplomas can be regarded as a platform on which further or continued professional development must be built. Ideally everyone starts with an education, broad fundamental basic knowledge and skills as per the NQF. On completion, the education career is rewarded with a diploma, or with a degree. However nobody reaches his/her pensionable age without continuously learning by doing, training, mentoring, experiencing or just by making mistakes.

Life long learning

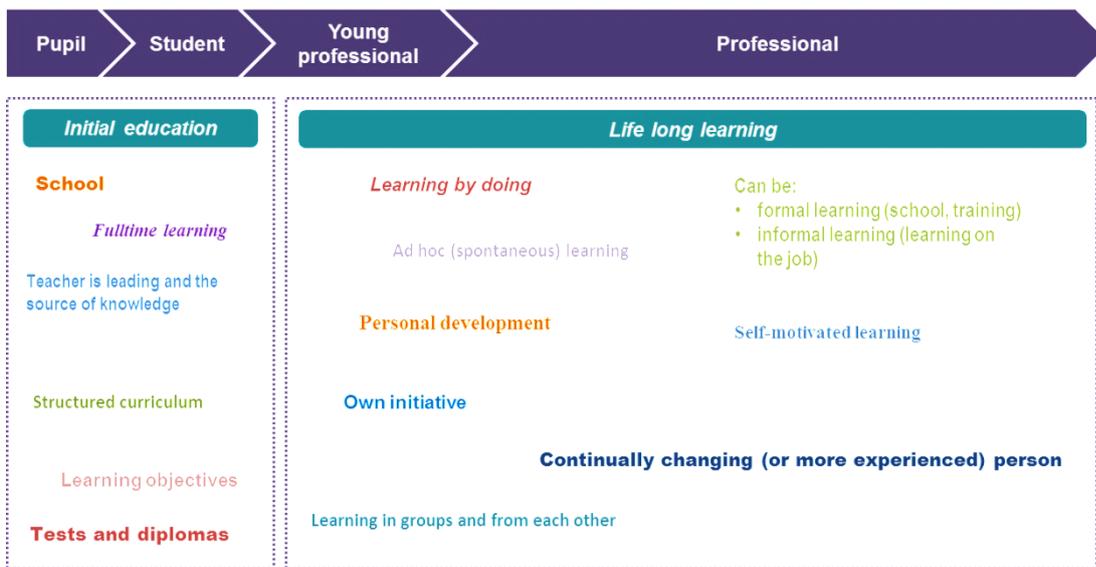


Figure 10: Lifelong learning

All over the world professionals continuously improve their skills and knowledge to stay up to date. Innovation, automation, communication and digital working procedures are main reasons that the work at the present time will change from what it was previously and from what it will look like in the future. In this respect, the water sector follows movements in society. However, water is a common commodity and not a booming business. The water sector is a relatively young and relatively small sector, and the number of water educational opportunities does not meet the demand. The need for training on water topics is high worldwide and lots of professional and practical training exists.

Wateropleidingen

Life long learning

Professional development



Personal development



Organization development



Wateropleidingen

In the Netherlands the employer and the employee have a joint responsibility for the continuous development of employees. This development covers professional, personal as well as organizational development. Furthermore, the annual personnel goals and review create a self-regulating mechanism. Employers often support the employee with training expenditure and time. If a diploma is a job requirement, a salary increase will be the follow-up of a diploma trajectory. Training is, so far, not regulated by the government.

Continued professional development may have different aims:

- to improve performance;
- for a qualification; and
- for CPD-points.

A huge number of South African people did not finish their schooling or do not have, due to poor schooling, the correct qualification. The frameworks governing the FET and HE sectors provide alternate routes, so that unqualified people will be able to get a proper qualification. Without a qualification, employees will not be appointed or will have no career path.

Alternate Education Routes for Workers

Workers and students who have not yet completed a high school education can follow a special route. In the figure below, students complete their first level of education at a FET College. Students can therefore enter the HE stream via the following routes:

- The FET College route after completing the National Certificate Vocational level 4 with the required grades and subject choices;
- The FET College route after completing the National Diploma N4 (NATED qualification) with the required grades and subject choices; or
- The recognition of prior learning route. This route is ideal for mature students who have not completed formal education but who have a vast amount of experience (See Appendix E).

The list of FET Colleges and those who offer water-related programmes are found in Appendix B.

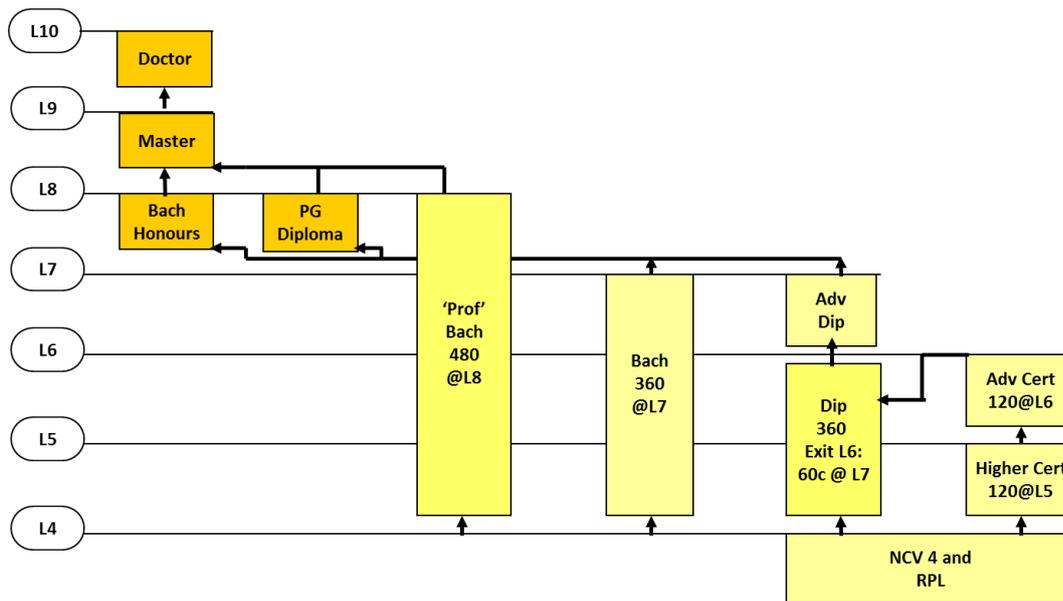


Figure 11: Alternative route model

It is recommended that courses fit into the FET/HE system as closely as possible, to enable non-qualified persons to gather credit points and enter an education stream.



11. International perspectives and opportunities

Education

Water management, water supply and sanitation are local issues. Although the basic knowledge is generic, techniques and practices have to be assessed for the South African situation. International collaboration can add value to the existing systems and curricula. To speed up the process, the international programmes (education as well as training) could be audited and customized for South Africa. The main challenges in the South African HE institutes are the inappropriate water curricula and the staff who have not been appropriately educated and who do not have experience in water-related fields. The Netherlands Niche programmes ZAF009 and ZAF016 contribute to the strengthening and improvement of the curricula of the water resource management and water and sanitation programmes from Cape Peninsula University of Technology (CPUT) and Tshwane University of Technology (TUT). More collaborative projects with international universities could accelerate this path.

A common problem for South Africa and the Netherlands is the lack of enthusiasm among young adults to choose a career in the field of 'water' or to start studies in the field of 'water'. Many interventions have been implemented, and the most successful ones seem to be the addition of international elements in the HE 'water studies' curricula. These interventions have attracted students, and led to improvements in student training collaboration, staff and student exchange programmes and staff training and collaboration. South African young adults have to be encouraged to learn scarce (water) skills, for example, by offering financial opportunities (bursaries) to students and informing them of potential jobs and careers in the field of 'water'.

For the vocational level, the water sector needs to collaborate with the FET colleges on the curriculum of subjects, practical exposure (internships), work place opportunities as well as curriculum input and collaborative projects.

Training

As the municipalities face a lack of skilled staff they have to train their people. Some main reasons that the skills-problem is not solved yet are the insufficient basic education of the staff; minor financial support from the SETA's; and a shortage of quality providers offering appropriate courses. Hence the major problem confronting local authorities seems to be that there are too many training providers offering short term courses that show hardly any improvement in the performance of their staff and have little if any lasting impact on the organisation (Wits-DBSA study, 2004).

During the last 10 years, many innovations entered South Africa, mostly supply driven. To develop a sustainable, affordable pool of water sector skills, the request and the need must be assessed and it should be a joint activity between the water sector and institutions providing education and training. The needs of the water sector must be clearly addressed. The existing staff will have to develop the professional skills to deal with the operation and maintenance of water provision. The SA water sector will have to select those technologies and new features that fit in with the country's policy on future water management. The training provided will also need to be considered from this point of view. Importing basic training courses on water topics that have good quality can speed up the professional competence and also contribute to CPD credits.

Peer-learning is often part of international cooperation programmes. This is recommended so that knowledge is made available to all South African water professionals. A lot of specialized knowledge has to be shared. In the words of Nelson Mandela: "Each one teaches one". WISA has been identified as an organization who can facilitate the sharing of such knowledge.

The Netherlands water sector has substantial experience with on-the-job-training and lifelong learning. The growth of the activities in water provision, sewerage and waste water treatment, as well as the lack of well-educated staff was the driving force behind this. The water sector took the initiative to exchange practical knowledge and to train colleagues from other companies. These initiatives were merged in 1993 when the Wateropleidingen Institute was established by the water sector and which provided professional and practical training and further education for the staff. The main goal of the Wateropleidingen institute was to organize quality training for the water sector. The driving force was a lack of water education for students. Nowadays there is a shift from further education to refresher courses and updating courses. The initial education gives alumni a proper basis to become employed, but the water sector requires more depth and specialization. That’s why the Wateropleidingen Institute has developed a system of professionals becoming trainers for other professionals. This lifelong learning system will ensure that appropriate qualifications are kept. As Wateropleidingen is a non-profit, non-funded, institution, the quality of the courses and training has to be excellent to continue the activities and remain a sustainable organization. The Wateropleidingen Institute approach and programmes will be assessed for their ability to adapt for delivery in South-Africa. (Appendix F)

The viability of an IWETs Academy or a similar organization in South Africa, which can coordinate and quality assure specialized courses, should be investigated.

Employer or governmental responsibility

The Dutch system of job requirements and personnel development is fully regulated by organizations or associations. In the annual staff assessments, the employer and the employee review prior goals and set new goals for the coming year (see figure 12). The employer often supports the employee for training expenditure and time. If a diploma is a job requirement, a salary increase will be the follow-up of a diploma trajectory. The government has no regulations regarding the diplomas from further education and training, however, the government stimulates learning

Job description:	Job title
	Aim of the function
	Position in the organisation
	Tasks
	Qualifications
	Responsibilities
	Salary

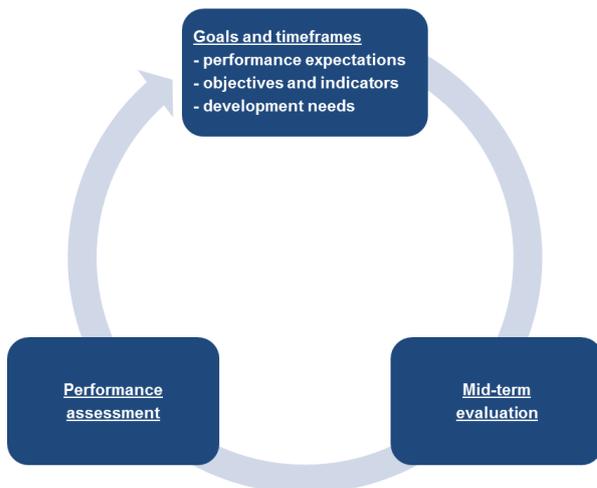


Figure 12: Employer/employee goal-setting

on the job and lifelong learning and the companies take the lead. A combination of the self-regulating mechanism and the CPD points system could be inspiring for SA. It is recommended that the CDP system is adapted for process controllers/vocational workers.



12. Conclusion

The challenges facing the South African water institutions are overwhelming though, with millions of South Africans who have either no access to basic water supply, or access to water that does not meet the basic services standard. This situation arises from a complex set of circumstances of which an important element is the technical skills levels of the staff responsible for the operation and maintenance of treatment plants. There is an overwhelming need for training which is exacerbated by a mismatch between qualifications and job requirements.

Currently there are 35 000 staff employed in the South African water sector with a number of vacancies at the 'Technicians and Trade Workers' level, resulting in increased workload for those who are employed. Although there are no figures readily available for the numbers of water practitioners, lack of compliance with regulatory provisions imply that the sector is not as effective as it should be.

With a range of career descriptors, occupational groups, career paths and profiles in the water services sector; providing a guide for skills planning, development and tracking is extremely difficult. In addition to this, the planning for skills development and the education provision available, is not aligned. Although the EWSETA (Energy and Water Sector Education and Training Authority) accredits training courses to ensure the quality of learnerships in the water sector, it is clear that the existing needs of the sector are not being addressed by the available courses.

The short term challenge for the sector then, is to train and re-skill employees to increase performance. At the moment there is no independent organisation offering advice on training possibilities and quality assuring water training.

The water sector is a relatively young and small sector and the number of water educational opportunities does not meet the demand in South Africa, however there are many professional and practical training opportunities worldwide, especially in the Netherlands. It is important that such training opportunities fit the FET/HE system in South Africa as closely as possible to enable potential candidates articulation routes across the NQF. It is also important for international programmes to consider local techniques and practices relevant to the South Africa context.

The other area for international collaboration is the training of staff currently in the system who lack the necessary professional skills, due to a shortage of quality training providers. Importing quality training courses on relevant water topics could speed up professional competence and the report identifies WISA as an organisation which can facilitate the sharing of such knowledge. The report further identifies the Wateropleidingen Institute in the Netherlands as a suitable partner given its professional and practical training experience.

There are no dedicated water and sanitation qualifications at levels 2 – 6 of the National Qualifications Framework (NQF), and those generic qualifications that offer some water-related modules do not produce graduates that are readily taken up in the water sector.

Young adults are not easily attracted to study in the field of 'water'. The water sector itself has to become more visible and attractive, f.i. by offering career paths and international collaboration.

The availability of enough and good quality water staff now and in the future can only be realized by an integrated approach of three main parties: the water sector, the education sector and training provision. A situation has to be created where the collaboration, the inter-dependencies and mutual responsibility for education, training and skills development and the water sector is improved to

enable the generation and maintenance of a core of skilled water practitioners. The following areas require specific attention:

1. Improvement of the role of the water sector and the SETA's to plan, undertake and execute skills needs analysis, planning and training provision,
2. Improved links and planning collaboration between the water sector, Higher Education, FET colleges and the regulatory bodies for the engineering and scientific professions, and
3. Coordinating and quality assurance of the training on the job and lifelong learning programmes by a proposed iWETs Academy institute

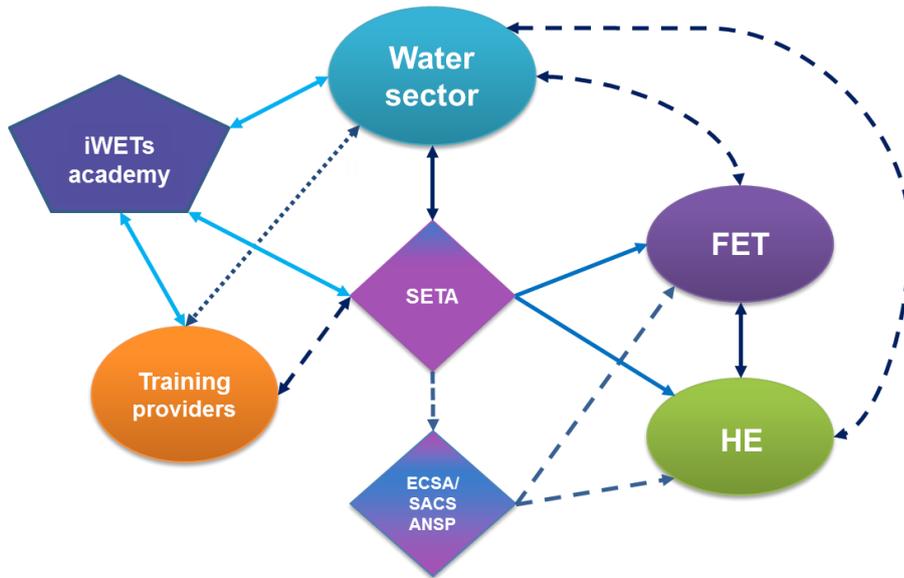


Figure 13: Interdependency between the water sector and education and training provision

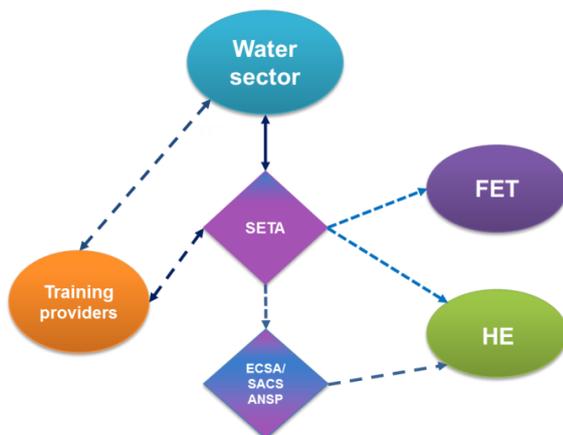
13. Recommendations

South Africa needs many well-capacitated staff to improve the provision of water and sanitation. These staff will be employed at municipalities, at the Department of Water Affairs as well as at water boards, service providers and other institutions. The resolution of these challenges will require short term and long term goals. The short term should focus on the development of staff and the unemployed people, while the long term should focus on the education of (future) students. **The existing policies and strategies have to be executed and an alignment between the water sector and education and training provision has to be created.**



THE WATER SECTOR: Linking occupations with skills development planning

The role of the Water sector together with the SETA's to plan, undertake and execute skills needs analysis, planning and training provision needs to be improved. Tracking trends in industry skills requirements and ensuring that skills training, development and management takes place are two critical roles of the SETA in both the Energy and Water sectors. EWSETA plays a very important role in the alignment between the water sector and the skills of its staff. In practice the EWSETA accredits all training programmes. The EWSETA is responsible for the compilation of a 5-year Sector Skills Development Plan (SSP) for the Energy and Water sectors. A SSP was published in September 2011, however the actual SSP shows a lack of numbers for the water services subsector. Effectively, an existing non-alignment of EWSETA inhibits capacity-building in the water sector.



The water sector has a direct interest in a well performing EWSETA; and therefore the cooperation between the water sector and EWSETA has to be strengthened. After this strengthening, the role of EWSETA could be changed to the translation of the trends and needs from the sector to the providers and to the educational institutions HE and FET. The role of quality assurance of the training provision can be conducted in collaboration with a specialized iWETs Academy (see topic 3).

All tertiary-related engineering qualifications are accredited by the Engineering Council of South Africa

Figure 14: Improve the connection between the water sector and EWSETA

(ECSA). All water-related qualifications will fall under this sector. EWSETA and ESCA can extend their roles in both the water sector and in the education and training sector, in order to create a better fit between quantity and quality of (future) water practitioners.

EDUCATION FET and HE

Needs of the water industry and sector are not very clear to FET and HE

FET colleges and HE institutes offer education programmes to prepare students for their working life. The curriculum has to be up-to-date and a diploma should open doors to a job and to a career. The relationship between the FET/HE sectors and the water sector is currently poor. Schools and universities rely on the existing programmes and the staff providing the tuition.

There is an urgent need to re-engineer FET College's provision so that they are able to meet the needs of the engineering sector and more especially the water sector. The following changes need to be made during the re-engineering phase:

- Offer water related qualifications, and
- Design the curricula so that students are able to meet the requirements to become artisans as well as being able to enter HE institutions after completion of the artisan training.

Water related qualifications should be offered at selected FET Colleges.

It is suggested that one FET College per region should be selected. The qualifications need to be designed so that students who complete them will have the educational requirements necessary to qualify as an artisan, as well as have the necessary fundamentals of mathematics and science to enter higher education engineering qualifications. This curriculum should be designed by a combination of people such as HE and FET academics, water industry, professional organisations and government. It is recommended that the professional body co-ordinate the process because of their experience in the development of engineering qualifications.

If the re-engineering is completed successfully the FET Colleges will become the first choice for a large number of students. The FET alumni can practise as artisans and they will have a [general] engineering qualification (with water specialisation) e.g. a certificate in engineering: water. The FET study includes skills training and workplace practise at existing facilities. The re-engineering process will only be successful if the students entering the programme have the necessary entrance requirements.

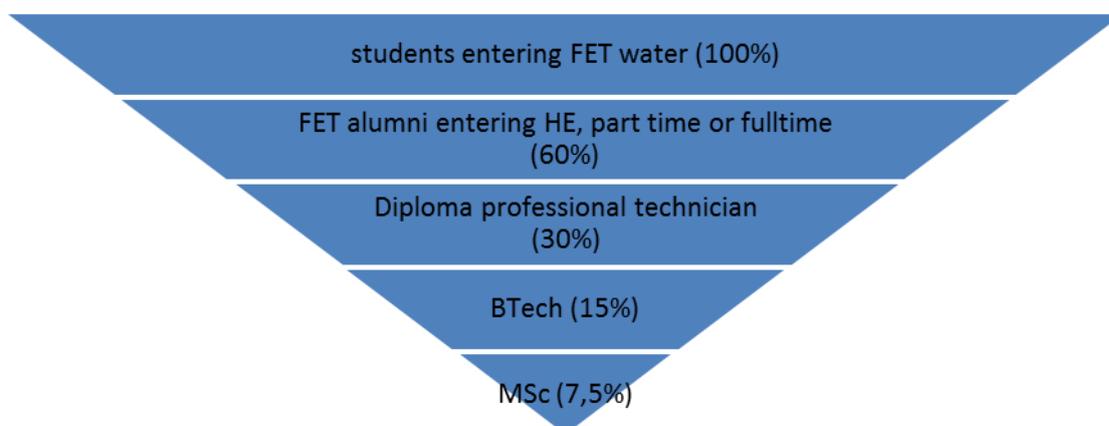


Figure 15: Estimated throughput of students into the educational levels

Currently there is a tendency for students who do not have the ability to complete or who are performing poorly at high schools to enter FET Colleges. The new FET will allow students to become

economically viable in a short period of time. FET water will be a promotional tool to attract people to water-related qualifications, especially if students will be given bursaries to complete these scarce qualifications.

The government through the SETA's must get involved by ensuring that students have the necessary finances to complete their studies, are placed for their experiential period, as well as being placed in industry after completing their formal studies at either the FET College or HE. Strengthening the relationship between the water sector and the FET/HE sectors will become a win-win situation, as illustrated in figure 16. This therefore means that SETA's are going to redefine their roles and responsibilities as follows:

- ➔ Become the link between FET Colleges, municipalities and water industry
- ➔ Place students for their work integrated learning as this will ensure skills training for students while studying (block releases to integrate theory and practise)
- ➔ The placement of students into companies after they qualify
- ➔ Design CPD courses that are credit-bearing for students who would like to improve their qualifications

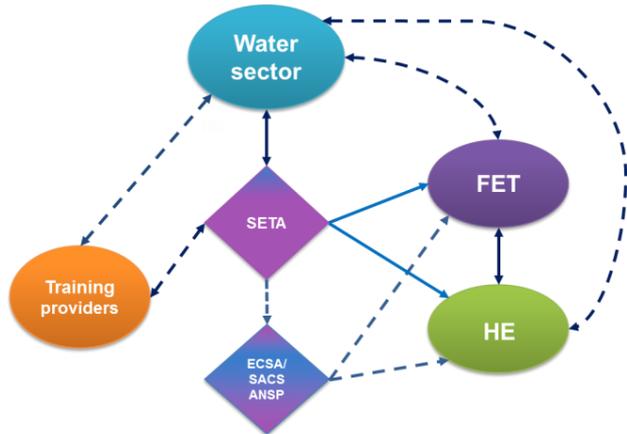
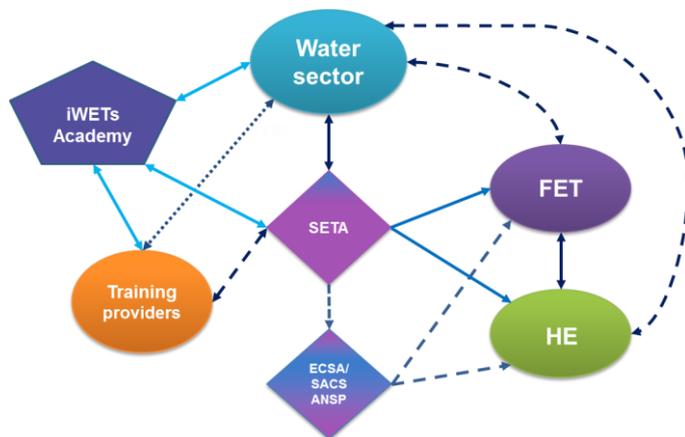


Figure 16: Re-engineering and strengthening HE and FET Water

TRAINING ON THE JOB AND LIFE LONG LEARNING

Coordinating and quality assessment of the training and lifelong learning programmes can be quality assured by a proposed iWETs Academy institute. This institute will facilitate and improve the delivery of training for the water sector, as well for the actual staff and the future staff.

Due to continuous developments in society and in research, the skills of water sector staff members need to be maintained, developed and expanded continuously. The internet and fast digital



connections make communication easy and fast, and therefore new jobs and new careers are created that should support the water sector. Also in the water sectors some jobs appear and others will disappear. The water sector has to support lifelong learning for their employees. The relationship between the water sector and the institutions/service providers is a market relationship: supply ↔ demand.

Figure 17: Re-engineering and strengthening HE and FET Water

The academy should have the water sector as stakeholders and be independent. The academy will coordinate between the existing and newly established providers like Vulindlela Academy, Centre of Expertise Ethekwini, Rand Water Academy, etc. and assure the quality of the programmes delivered.

14. Projects and priorities

The recommendations from chapter 12 are specified into 20 proposed projects. The projects can be prioritized using 5 criteria, being:

- a. Short-term effect (< 1,5 years) or medium term (5 - 10 years)
- b. Education level 4 - 6 or governing level (board members or councilor)
- c. Formal learning of Lifelong learning/ continuous training
- d. Supply sufficient/compliant water (more green/blue drop awards)
- e. Improved asset management and maintenance from day 1

PROJECTS FOR THE WATER SECTOR

1. The mechanisms and procedures to determine the education, training and skills development needs in the water sector need to be improved. A good collaboration between the water sector, as well as the EWSETA and LGSETA, would make a difference. In particular the non-governmental and regulatory components of the water sector need to:
 - Investigate the number of water professionals needed in 2015 and 2020;
 - Create and maintain an education, training and capacity-building projects register;
 - Create and maintain a document library of all the outputs of the projects captured in the register;
 - Create a platform/hub that can be used for skills surveys and audits to allow for consistency in the processes to determine education, training and skills requirements; and
 - Align the OFO with the occupations required in the water sector.
2. As the actual performance, according to the Blue and Green drop status has to improve, a training path should be available to train and re-skill employees to increase performance.
3. The South African water sector will need innovative technologies to meet the future needs. It is recommended that a body be created to evaluate and regulate international technologies. Water professionals have to incorporate these innovations and new technologies.
4. The water sector has to develop, implement and maintain a system of lifelong learning for all levels of practitioners. A combination of the Dutch self-regulating mechanism of continuous development between employer and employee could be inspiring for South Africa. It is recommended that the CPD system is adapted for process controllers/vocational workers.
5. The Water Institute of Southern Africa (WISA) should play a significant role by representing its members in the water sector. A model that will allow WISA to play a professional role in the water sector (e.g. ECSA) has to be developed
6. A huge number of South African people did not finish their schooling or do not have, due to poor schooling, the correct qualification. Vacant posts in the water sector can be filled by employing non-qualified people. They have to be trained on the job and they need appropriate training that leads to a professional qualification and a career path.
7. The number of students registering for curricula with a water focus is not meeting the future needs. The water sector seems to be invisible and less attractive to students. Water and waste water departments of the municipalities/water companies/institutions can contribute to the capacity of the future water practitioners in the following ways:
 - Curriculum input for FET and HE
 - Supply professionals as a teacher or trainer
 - Create dedicated water-related learnerships
 - Organize mentor-learning for teachers
 - Provide workplaces and study projects
 - Employ non-registered interns
 - Employ unemployed graduates
 - Inform children at schools/ Create awareness programmes for the water sector

PROJECTS TO STRENGTHEN WATER EDUCATION AT HE AND FET

8. Improve the practical aspects in FET and HE programmes by:
 - Recruiting guest teachers for practical levels (FET colleges)
 - Training-the-Trainer (training academics in water knowledge and teaching methods)
9. Stimulate young adults to learn scarce (water) skills by:
 - Creating funding opportunities for learners, students
 - Informing young adults of the challenges and potential careers in water
 - HE and FET developing specific water curricula.
 - Water and waste water departments of the municipalities/water companies/institutions contributing to curriculum input, dedicated water-related learnerships, mentor-learning for teachers and providing workplaces and study projects.
10. Add international elements into HE water studies to attract students and improve the student base through
 - Practical exposure
 - Curriculum input
 - Collaborative projects
11. Develop educational standards of dedicated water-related qualifications from levels 2 to 6. These standards must be designed so that there is seamless articulation from the FET sector to the higher education sector. The standards need to be developed together with the Government, Industry, SETA's and Academics. It would be advisable that a neutral facilitator be appointed to manage the process.
12. The lack of artisans in the water sector needs to be addressed. This challenge will only be addressed if there is a project to re-engineer the FET sector's qualifications. This will mean that the FET sector offers qualifications that have a mix of both vocational and practice. Students completing a NCV 4 programme should have the educational requirements to complete an artisanship.

PROJECTS TO CO-ORDINATE TRAINING ON THE JOB AND LIFELONG LEARNING

13. The training provision landscape is scattered, the training programmes ad hoc and there is no independent organization offering advice on training possibilities and assuring quality of the water training. The training programmes offered should fit into the FET/HE system as closely as possible to enable persons to gather CPD points.
14. Nevertheless the exact number of employees needing training and the occupational profiles are not fully clear. A training path should be available to train and re-skill employees to increase performance. Vacant posts have to be filled by employing non-qualified people. They must be trained on the job and they need appropriate training that leads to a professional qualification. At the moment there is no independent organization offering advice on training possibilities and quality assuring water training.

The iWETs Academy can store and spread water knowledge. The aim is to facilitate, coordinate and provide advisory services and to work towards professionalization of the water sector by:

 - Starting up a website for giving advice (to suppliers) on capacity-building and training,
 - Setting up a system for the quality assurance of informal training,
 - Providing a dedicated development path that will merge the needs of the water sector with the non-registered alumni and the unemployed graduates ,
 - Creating a CPD system for all categories of water practitioners, and
 - Evaluating the usefulness of the Wateropleidingen Institute programmes for South Africa.
15. The members of the Water Institute of Southern Africa (WISA) can play a significant role in peer-learning or by sharing their knowledge and training younger, less experienced colleagues. A

Train-the-Trainer model for water practitioners to become a professional teacher, mentor or trainer (to train academics in water knowledge and teaching methods) has to be offered

16. Water and waste water departments of the municipalities/water companies/institutions create opportunities to:
 - Create dedicated water-related learnerships
 - Create live water laboratories
 - Mentor-learning for new staff members
 - Employ non-registered interns
 - Employ unemployed graduates

GENERAL PROJECTS

17. Standards and qualifications have to be formulated for all the occupations and all the education levels in the water sector.
18. Councillors, technical portfolio committee (political) members and water managers of the municipalities have to create awareness of their duty and responsibility regarding water issues.
19. Change the tender system in the water sector to include a compulsory training component. Funding agencies have to add conditions to the funding of new infrastructure to ensure that the training of the process controllers/workers is complete before handing over the infrastructure. The training has to be conducted by accredited organizations.
20. Create a body to evaluate and regulate international technologies (stuff versus bright relevant know how)

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www.ecsa.co.za/ Engineering Council of South Africa

www.ewisa.co.za Electronic Water information for Southern Africa. Water Institute of Southern Africa and WAMTechnology (District and Local Municipality data)

www.che.ac.za Council on Higher Education

www.nqf.ac.za The National Qualifications Framework of South Africa

www.saga.org.za South African Qualifications Authority

www.wateropleidingen.nl The Dutch training institute for water management

www.worldwateracademy.nl The World Water Academy concept

List of Appendices

- Appendix A: Blue and green drop results
- Appendix B: Overview of Further Education and Training colleges
- Appendix C: Overview of South African universities
- Appendix D: Water practitioners: The demand and the needs
- Appendix E: Recognition of prior learning
- Appendix F: The Wateropleidingen model

The report and the appendices are available at:

www.iwets.co.za

www.wateropleidingen.nl

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