



AQUATIC BIOLOGIST

Well-functioning catchments, made up of rivers, wetlands, estuaries, springs and aquifers are critical in supplying enough, good quality freshwater to support ecological functioning, the needs of the economy for example, in production and manufacturing and human wellbeing. Understanding aquatic biology, freshwater quantity and quality and ecosystem functioning and impacts can inform strategies to ensure future water security.

Aquatic biologists study the ecology and living organisms in freshwater. They monitor the health of water by examining biological indicators such as micro and macroinvertebrates as well as the physical conditions of water such as salinity, temperature and oxygen content. Aquatic biologists also monitor and report on pollution levels and its impact on water quality.

Aquatic biologists work mostly in the field collecting samples and monitoring water quality as well as run tests and develop computer models in laboratories. They are likely to collaborate with all stakeholders in catchments, for example local communities and policymakers, addressing water quality challenges and opportunities.

Skills

Aquatic biologists must have an extensive knowledge of freshwater ecology, and biological species in freshwater systems. They will further benefit from:

- Ability to conduct extensive and complex fieldwork
- Strong research and analytical competence
- Excellent laboratory processing skills
- Good verbal and written communication and presentation skills

Tasks

- Research aspects of plant and animal life in water and the inter-related environmental conditions
- Conduct field research, collect samples and make observations of the health and behaviour of plant and animal organisms
- Analyse data and write reports on research findings
- Liaise with stakeholders, conferring reported findings

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Biological Sciences specialising in Botany or Zoology at all universities

B.Sc., B.Sc. (Hons), M.Sc. in Biodiversity and Conservation Biology or Environmental Water Sciences at UWC

Employers

National, provincial and local government.

NGOs, community-based and development organisations and private consultancies.

Research institutions.



Forestry, Fisheries and the Environment
Higher Education and Training





PLUMBER

Access to good quality potable water and adequate sanitation, is a global human right. Efficient water access is critical for human wellbeing and supporting the economy and the jobs and livelihoods it supports. In a water scarce country like South Africa, water use efficiency is paramount. Appropriate plumbing systems are important for the safe provision of water and the efficient processing of wastewater.

Plumbers install and repair water provisioning, drainage and sewerage pipes and systems. They are involved with the construction of new houses and plumbing systems, but also with assessing and fixing problems in existing and older systems. Plumbers can specialise in the installation and maintenance of sustainable plumbing systems such as rainwater tanks, solar hot water and greywater plumbing systems that will assist users in efficient water use and reducing environmental impact.

Plumbers work in a variety of domestic, commercial and municipal locations. They interact with a variety of people from homeowners to building and construction managers. Work hours can vary, especially with emergencies.

Skills

Plumbers must have a sound knowledge of plumbing practices, legal compliance and safety regulations. They will benefit from physical stamina and:

- Good manual dexterity and coordination
- Ability to read and interpret blueprints
- Problem-solving competence
- Foundational measuring and mathematical ability

Tasks

- Measure, cut, thread, bend, join, assemble, install, maintain and repair plumbing features
- Install dishwashers and water heaters, sinks and toilets
- Lay clay, concrete or cast-iron pipes to form sewers, drains or water mains
- Inspect, examine and test installed systems and pipes

Studies

Plumbers are trained through a National Certificate in Engineering Studies in Plumbing at National Qualifications Framework Level 1 to 3 offered at all Technical and Vocational Education and Training Colleges across the country.

They can also qualify with a General Certificate in Plumbing offered at Eastcape Training Centre, SA Plumbing Trade School and uMfolozi Technical and Vocational Education and Training College.

Vocational registration of plumbers is a requirement for practice.

Employers

National, provincial and local government.

Plumbing and pipe-fitting companies.

Construction companies.

Independent consultancies.



Forestry, Fisheries and the Environment
Higher Education and Training





WASTEWATER PLANT OPERATOR

Effective wastewater management is critical for human health and well-being. It is also critical to maintaining the integrity of both ecological and built infrastructure. In urban centres, particularly in sites of dense living, the need for effective wastewater management is even more important. A key service in wastewater management is the operation of wastewater plants, that involves the removal of pollutants from wastewater.

Wastewater plant operators manage activities in a plant that stores, distributes and treats water for safe disposal and domestic and commercial reuse, through the removal of pollutants and the treatment of wastewater. They collect, test and analyse water samples as well as operate chemical-feeding devices for the treatment of wastewater. Some operators repair pumps and valves, reporting more serious defects if necessary.

Wastewater plant operators work in the plant site and may be exposed to hazardous chemicals and unpleasant odours. They can engage with scientists and technicians in laboratories to process and analyse test samples.

Skills

Wastewater plant operators must have a thorough knowledge of plant mechanics and machinery and chemical principles. They also need an in-depth understanding of water quality standards and regulations, coupled with:

- Critical thinking and problem-solving competence
- Strong organisational ability around plant activities
- Keen attention to detail and accuracy
- Skills to effectively manage plant operations

Tasks

- Collect and test water and sewage samples
- Control equipment operation and treat wastewater with chemicals
- Analyse test results and adjust plant equipment, chemical input and systems
- Inspect equipment and monitor conditions to detect malfunction

Studies

Wastewater plant operators can benefit from a General Certificate in Water and Wastewater Reticulation Services at National Qualifications Framework Level 2 to 4 offered at CPUT and the Water Academy.

They can also benefit from a National Certificate in Water and Wastewater Treatment Practice at National Qualifications Framework Level 1 to 4 offered at Technical and Vocational Education and Training Colleges. Training could also take place on the job with mentoring by an experienced operator.

Employers

Wastewater treatment plants.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER ALLOCATION OFFICER

South Africa is a water scarce country with highly variable rainfall and drought patterns, making water a high premium reserve. Using water efficiently is critical for both effective ecosystem functioning as well as sustainably providing water for basic human needs. Water allocation involves assessing present and future water demand and enabling adequate and equitable access to water, for commercial and domestic use.

Water allocation officers monitor the allocation and use of water from rivers, dams and reservoirs. They advise on and develop distribution and allocation policies, strategies and guidelines for water use. They also oversee water use registration and licensing and maintain oversight of water availability and demand. Some officers can also provide inputs for water user billing and water pricing.

Water allocation officers work in an office environment but often travel to sites to monitor and perform inspections. As part of their evaluations, they can engage with community members, local departments and engineering and water professionals.

Skills

Water allocation officers require a thorough understanding of the water cycle, urban and rural water systems and knowledge of water use guidelines, laws, policies and regulations. They will further benefit from:

- Ability to use geographical software to monitor and map data
- Strong problem-solving ability
- Analytical skills with excellent critical thinking capacity
- Good communication and negotiation skills

Tasks

- Develop and implement water use regulatory frameworks for institutions and organisations
- Assess water use license applications and permits
- Coordinate varied stakeholder inputs into water use licensing
- Provide support and advise water use authorisation processes

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Hydrology at NWU, UKZN, Univen and Unizulu

B.Sc., B.Sc. (Hons), M.Sc. in Environmental Science specialising in Water Science at NWU, RU, UJ, UMP, UP and Wits

B.Sc., B.Sc. (Hons), M.Sc. in Environmental and Water Science at UWC

B.Sc. in Hydrology and Water Resources Management at CUT

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Employers

National, provincial and local government.

Water utility companies.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER AND WASTEWATER ENGINEER

South Africa is a water scarce country, intensified by climate variation and extreme events such as drought and floods. Increasing demand, encroachment on ecological infrastructure and functioning and maintenance of built infrastructure can compromise access to sufficient, clean water. Water and wastewater engineering ensures the design of water and wastewater systems to support ecological, economic and social needs and the sustainable management of water resources.

Water and wastewater engineers design and oversee projects involving the management, distribution, disposal and treatment of water. They conduct water quality and feasibility studies for the location and development of facilities such as water supply systems or water treatment plants. They also design and perform analyses on the most effective equipment and processes needed for functioning water systems. Some can provide interventions and risk management for the provision of flood-related damage or drought contingency systems.

Water and wastewater engineers liaise with water quality and use specialists, urban and town planners and other engineers and specialists around water and wastewater management systems. They work in an office environment and often travel to project sites to monitor and direct operations or address on-site challenges.

Skills

Water and wastewater engineers need a sound knowledge of engineering principles and an understanding of water and environmental regulations, processes and challenges, coupled with:

- Critical problem-solving and analytical thinking ability
- Ability to design water and wastewater equipment and processes
- Independent project management competence
- Good verbal and written communication and presentation skills

Tasks

- Oversee the construction, operation and maintenance of water systems
- Design and develop equipment and projects around water management systems
- Conduct impact studies related to water and wastewater collection, treatment or distribution
- Provide technical direction and support around water engineering projects

Studies

B.Sc.Eng. in Civil Engineering specialising in Water Engineering at UCT, UKZN and Wits

B.Eng. in Civil Engineering specialising in Water Engineering at SU, UJ and UP

Diploma, Advanced Diploma, M.Tech in Civil Engineering at CPUT, CUT, DUT, MUT, TUT, UNISA, VUT and WSU

Employers

National, provincial and local government.

Water utility companies.

Water treatment plants.

Research institutions.

NGOs, community-based and development organisations and private consultancies.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER CONTROL OFFICER

South Africa is generally an arid country with variable rainfall and is prone to droughts. Its freshwater is supplied by 22 water source areas situated in the highest lying plains of our water catchments, where the most rainfall is received. The availability of good quality freshwater is a basic right and critical for sustaining livelihoods, wellbeing and the economy. Water resource management is crucial to ensure enough quality freshwater.

Water control officers monitor and control water abstraction in catchment areas. They undertake the inspection of dams in accordance with legislation and assist with water registration, validation and issuing of water licenses. They can also record water meter readings and alert designated authorities on the misuse of water resources.

Water control officers work in teams, occasionally engaging with water quality analysts and engineers to ensure the sustainable use of water resources. They often travel to water supply areas such as dams and reservoirs, returning to an office environment to strategize water control procedures.

Skills

Water control officers require knowledge of water management and distribution systems and the legislation and regulations that govern water provision in South Africa. They will also benefit from:

- Understanding the principles of monitoring and evaluation
- Good analytical and problem-solving skills
- Strong organisational ability
- Good verbal and written communication skills

Tasks

- Control and release the distribution of water
- Record and monitor water balances and metre readings
- Collect and keep records of hydrological data
- Inspect and report on dam and reservoir infrastructure maintenance

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Environmental Science specialising in Water Science at NWU, RU, UJ, UMP, UP and Wits

B.Sc., B.Sc. (Hons), M.Sc. in Environmental and Water Science at UWC
M.Sc. in Water Management at UFS and UP

B.Sc. in Hydrology and Water Resources Management at CUT

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Water control officers can also benefit from a General Certificate in Water Demand Management offered at Rand Water, accredited by the Energy and Water Sector Education and Training Authority.

Employers

National, provincial and local government.

Water utility companies.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER INSPECTOR

South Africa experiences high variability in rainfall, both geographically and periodically. An arid country, large parts experience severe droughts and it is typically described as a water scarce country. Water is essential in maintaining effective ecosystem functioning, providing domestic water and sanitation and sustaining the economy. Monitoring water use through regular inspections supports the sustainable use and highlights opportunities to improve water supply and access.

Water inspectors evaluate and inspect the extraction, use and quality of water in domestic use, irrigation in agriculture and manufacturing purposes. They regulate and monitor water permits and licensing and facilitate investigations around water use complaints and infrastructure compliance. They also inspect water storage facilities such as instream and off-channel dams to ensure they comply with water regulations.

Water inspectors engage with landowners and communities as well as land use planners and engineers. They frequently undertake site inspections at wastewater treatment facilities, reservoirs, dams and even beverage manufacturing plants, returning to an office to evaluate and report on usage.

Skills

Water inspectors need a comprehensive understanding of water systems in urban and rural areas and knowledge of water use guidelines, laws, and regulations, coupled with:

- Methodical approach to investigation
- Analytical and critical thinking ability
- Excellent problem-solving ability
- Safety awareness and consideration

Tasks

- Inspect water infrastructure, plumbing, piping, fixtures and water metres
- Conduct water flow and pressure tests
- Investigate complaints, emergency calls and causes of unusual consumption
- Examine and monitor permits and water licenses

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Environmental Science specialising in Water Science at NWU, RU, UJ, UMP, UP and Wits

B.Sc., B.Sc. (Hons), M.Sc. in Environmental and Water Science at UWC

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Water inspectors can benefit from a Further Education and Training Certificate or National Certificate in Water Treatment Practice at National Qualifications Framework Level 1 to 3 offered at Technical and Vocational Education and Training Colleges.

Employers

National, provincial and local government.

Water utility companies.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER LIAISON PRACTITIONER

Water is a critical resource for human wellbeing, ecosystem functioning and supporting all forms of economic activity. From catchments, water travels a long journey through multi-purpose landscapes providing water along the way for various ecological, domestic and economic purposes. Sustainable use of water resources requires collaboration amongst all key stakeholders in catchments and downstream users in urban areas. Water liaison practitioners provide clear and concise water related information for good governance, and management that promotes equitable and sustainable water use.

Water liaison practitioners develop and implement communication strategies to relay appropriate water-related information to promote sustainable water resource management and use. They analyse water related legislation and policies and its application. They also establish, maintain and promote collaborative relationships and partnerships amongst water users. Some also organise events and workshops around specific water projects and coordinate the participation of stakeholders.

Water liaison practitioners regularly consult with varied public and private stakeholders, scientists and businesses. They work in an office environment but regularly travel to sites to gather information and talk to strategic partners.

Skills

Water liaison practitioners require a thorough knowledge of water practices and associated legislation and policies governing water access and use, coupled with:

- Excellent interpersonal and networking skills
- Strong analytical and problem-solving ability
- Events coordination and management skills
- Good verbal and written communication and presentation skills

Tasks

- Design and develop water related communication strategies
- Establish, maintain and promote collaborative partnerships
- Initiate, coordinate and promote water stewardship events
- Identify and analyse appropriate systems and tools for information dissemination

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Environmental Science specialising in Water Science at NWU, RU, UJ, UMP, UP and Wits

B.Sc., B.Sc. (Hons), M.Sc. in Environmental and Water Science at UWC

B.A., B.A. (Hons), M.A. in Communication Studies at NWU, UFH, UFS, UJ, UL, UNISA, Unizulu and UWC

Diploma, Advanced Diploma, M.Tech in Public Relations and Communication at CPUT, DUT, TUT, UJ, VUT and WSU

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Employers

National, provincial and local government.

Catchment management agencies.

Water utility companies.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER QUALITY ANALYST

South Africa is an arid, water scarce country with variable rainfall patterns both geographically and periodically. Water therefore has a high currency in South Africa. That which we have, has to be used efficiently and sustainably. Along the journey of water from catchment to coast, various domestic and commercial activities could impact the quality of water and in turn threaten the health of individuals, ecosystems and economic activity. Water analysts assess water quality and develop strategies to address any challenges.

Water quality analysts analyse freshwater and develop policies and plans for the control of factors which may produce water pollution. They collect water samples, conduct chemical, bacteriological, physical and biological analyses and compare the results to predefined water quality standards. They then provide recommendations and procedures to address challenges or maintain or improve water quality.

Water quality analysts work between laboratories analysing water samples and the field collecting samples in dams and wastewater treatment plants, for example. They can be exposed to hazardous organic materials and inorganic chemicals and are required to wear protective clothing and equipment.

Skills

Water quality analysts require a comprehensive knowledge of water chemistry and biological properties and a thorough understanding of the standards that govern water quality. They will further benefit from:

- Competence in laboratory processes and equipment
- A sound analytical approach to problem-solving
- Good attention to detail and organisational ability
- Ability to easily communicate complex concepts

Tasks

- Conduct research and fieldwork and analyse water samples
- Develop and coordinate the implementation of environmental management systems
- Conduct audits to evaluate environmental impacts of existing activities
- Advise and recommend ways to prevent, control and remediate water pollution

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Biological Sciences at all universities

B.Sc., B.Sc. (Hons), M.Sc. in Chemistry at all universities

B.Sc. in Water and Sanitation at UL

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Employers

National, provincial and local government.

Research institutions.

Water treatment plants.

Private consultancies and testing laboratories.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER RESOURCE MANAGER

As a water scarce country that experiences high variability in rainfall, both geographically and seasonally, water is a premium resource in South Africa. Sufficient availability and access to quality water is exacerbated by climate change, and resultant droughts and floods, with many parts of South Africa experiencing severe ecological, economic and livelihood impacts. Effective water resource management can help plan, develop and manage strategies for the optimum use of water resources.

Water resource managers design and implement water resource programs and strategies, related for example, to ecological infrastructure and provision such as supply, quality and regulatory compliance. They conduct investigations around water storage, wastewater discharge, compliance and regulatory challenges and identify specific sources of water pollution. They also assess the implications of proposed water resource schemes and drought management measures. They develop strategies to address water supply, conservation and ecosystem management, and regulatory compliance according to water standards and laws.

Water resource managers consult with water quality analysts, engineers and other professionals to develop water resource protection plans. They work in an office environment and occasionally go into the field to collect specific data or make observations.

Skills

Water resource managers need a solid understanding of hydrological processes and water quality standards and experience in implementing water programmes, coupled with:

- Critical problem-solving and analytical thinking ability
- Understanding of water compliance and regulatory legislation
- Experience in modelling and mapping hydrological data
- Excellent verbal and written communication and presentation skills

Tasks

- Oversee investigations of water quality, storage and compliance
- Create and implement water monitoring and assessment methods
- Develop strategies and opportunities for water resource improvements
- Advise on the development or implementation of varied water programmes

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Hydrology at NWU, UKZN, Univen and Unizulu

B.Sc., B.Sc. (Hons), M.Sc. in Environmental Science specialising in Water Science at NWU, RU, UJ, UMP, UP and Wits

B.Sc., B.Sc. (Hons), M.Sc. in Environmental and Water Science at UWC

B.Sc. in Hydrology and Water Resources Management at CUT

M.Sc. in Water Resource Management at UP

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Employers

National, provincial and local government.

Catchment management and other local water management agencies.

Water utility companies.

Private consultancies.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER TREATMENT PLANT OPERATOR

Water security, for ecological security and domestic use, is a high priority in a water scarce South Africa, with high rainfall variability, geographically and seasonally, further exacerbated by changing climate. The treatment of wastewater ensures the safe reuse of water, domestically and in industry, and helps to ensure water security. The removal of harmful contaminants in wastewater and the maintenance of water treatment infrastructure can assist in securing a complementary source of clean water for domestic and economic use.

Water treatment plant operators operate plant equipment and processes to store, treat and distribute water including water purification for domestic use and removing waste and contaminants from sewage water. They collect and analyse samples throughout the treatment process to ensure adequate chemicals are added to purify the water. They also inspect equipment and monitor operating conditions to ensure they are functioning correctly.

Water treatment plant operators assist water quality analysts and water service technicians in analysing water quality and operating the treatment plant. They are exposed to harmful chemicals and substances, requiring them to wear protective clothing and equipment and may work extra hours during emergencies such as storm water surges.

Skills

Water treatment plant operators need knowledge of chemistry and understand the principles and procedures related to the operation and maintenance of a water treatment plant, along with:

- Critical problem-solving and analytical skills
- Meticulous attention to detail
- Ability to troubleshoot basic machinery issues
- Good physical stamina

Tasks

- Collect and test water samples for chemical and bacterial content
- Analyse test results to adjust plant equipment and systems
- Perform security and safety checks on equipment and the plant
- Complete and maintain plant logs and records

Studies

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Water treatment plant operators can benefit from a Further Education and Training Certificate or National Certificate in Water and Wastewater Treatment Practice at National Qualifications Framework Level 1 to 4 offered at CPUT and Technical and Vocational Education and Training Colleges. Training could also take place on the job with mentoring by an experienced operator.

Employers

Wastewater treatment plants.



Forestry, Fisheries and the Environment
Higher Education and Training





WATER USE SPECIALIST

South Africa is a water scarce country with variable rainfall seasonally and geographically and 50% of the country's water is produced in 8% of the land. 62% of water resources are used by agriculture, 3% by forestry and 27% by municipalities. South Africa's water supply needs to be carefully managed to ensure effective ecosystem functioning, economic sustainability, growth and development and human health and wellbeing. Water use monitoring provides evidence to guide effective water resource use and management.

Water use specialists monitor, evaluate and audit water use programs or initiatives. They conduct water use surveys and collect and analyse water samples to determine changes in water supply and quality. They also develop and operate data and information management systems to enable effective water resource monitoring. Some report and advise on strategies to address water use challenges and opportunities as well as water regulation processes.

Water use specialists can engage with communities, land use planners, engineers and water professionals in monitoring water use practices. They spend time between the field, laboratory and office analysing data and drafting feedback reports.

Skills

Water use specialists need a solid knowledge of hydrological processes and water use practices and a strong understanding of water compliance and regulatory legislation. They will also benefit from:

- Strong analytical and problem-solving ability
- Ability to carry out fieldwork and laboratory processes
- Good project management competence
- Good verbal and written communication and presentation skills

Tasks

- Carry out water resource monitoring and evaluation
- Operate and maintain supporting data, information and report management systems
- Compile and present investigation feedback reports
- Advise stakeholders on authorisation, compliance and enforcement processes

Studies

B.Sc., B.Sc. (Hons), M.Sc. in Hydrology at NWU, UKZN, Univen and Unizulu

B.Sc., B.Sc. (Hons), M.Sc. in Environmental Science specialising in Water Science at NWU, RU, UJ, UMP, UP and Wits

B.Sc., B.Sc. (Hons), M.Sc. in Environmental and Water Science at UWC

B.Sc. in Hydrology and Water Resources Management at CUT

Diploma, Advanced Diploma, M.Tech in Water Science and Technology at TUT

Employers

National, provincial and local government.

Catchment management and other local water management agencies.

Water utility companies.

Private consultancies.



Forestry, Fisheries and the Environment
Higher Education and Training

