

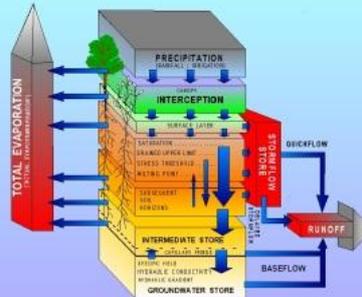


# Centre for Water Resources Research

## Post-Graduate Research Opportunities: 2017/2018



ACRU - Agrohydrological Model



## Developing Future Hydrological Scientists

<http://cwrr.ukzn.ac.za/>

**MSc, PhD or Post-Doctoral Opportunities at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**UPDATING AND/OR DEVELOPING NEW TECHNIQUES FOR DESIGN FLOOD ESTIMATION  
IN SOUTH AFRICA**

**Scholarship description:**

Many of the techniques and approaches currently used in South Africa to estimate design floods which are required for the design of hydraulic structures are based on methods developed in the 1970s and 1980s and which utilised data and computing technology available at the time. With currently available longer periods of records, computing power, GIS and national scale databases, the potential exists for updating the methodologies and/or developing new approaches to design flood estimation which could include the potential impacts of climate change on the estimation of design floods in South Africa. As a consequence, the South African Committee on Large Dams (SANCOLD) and the Water Research Commission (WRC) have initiated a National Flood Studies Programme (NFSP) to modernise methods used for flood estimation in South Africa. Opportunities also exist to (i) assess the impact of declining observation networks and poor data quality on the estimation of design floods, and (ii) develop methods for design flood estimation in data sparse regions, as typically found in many parts of Africa.

**Eligibility:**

The successful candidate(s) should be focussed, disciplined, able to work as a member of a team, and be able to set and meet deadlines. Candidates are expected to have at least a BSc (Hon) degree in Hydrology or a BSc Eng degree in a related discipline. Experience in design flood estimation and/or hydrological modelling is a prerequisite. Proficiency in English, both verbal and written, is required. For funding, candidates need to be full time students, but part time and self-funded students are welcome to apply.

**Scholarship package:**

Funding of up to R75 000 for MSc, up to R120 000 for PhD and up to R220 000 for postdoc are potentially available for full time students, dependent on available project funds. These positions are based at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). Candidates will be expected to cover all living expenses including travel to and from the University out of this stipend. All project running costs will be covered through the project budget. Candidates will be expected to find private accommodation, and make own arrangements for medical insurance and study permits if they are international students.

**How to Apply:**

Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent project report or publication to [smithers@ukzn.ac.za](mailto:smithers@ukzn.ac.za).

**MSc Studentship at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**WATER USE QUANTIFICATION AND ACCOUNTING**

**Scholarship description:**

With the increasing scarcity of water, reliable information on water availability and use is required for water management. Agriculture is the largest water user worldwide, so it is important that accurate information on agricultural water use and return flows is available for water resource planning and management. Urban water users in a catchment can require a high gross abstraction at a high assurance of supply, but return a portion of the abstracted water, albeit potentially with a lower quality. Water resource accounts aim to show water inflows, outflows, storage and depletion within a catchment. In this project there will be further development of an integrated and consistent methodology for estimating actual water availability and use and summarising this information in the form of water resource accounts. Such an integrated system needs to be able to compute the water balance and estimate water use by different sectors. Potential areas for research by postgraduate students include:

- (i) Methods for improving remotely sensed estimates of catchment rainfall,
- (ii) Improving estimates of irrigation water use,
- (iii) Improving estimates of urban water use and return flows,
- (iv) Improving estimates of water stocks in the form of dam storage, soil moisture and groundwater,
- (v) Investigating the subdivision of catchments into bioresource response regions, and
- (vi) Investigating linkages between water, land and ecosystem accounts.

**Eligibility:**

The successful candidate should be driven, disciplined, able to work as a member of a team, and be able to set and meet own deadlines. The candidate is expected to have a BSc (Hons) degree in hydrology or a BSc Eng degree in a related discipline. Experience in hydrological modelling and/or remote sensing is a prerequisite. Proficiency in English, both verbal and written, is required. Candidate needs to be a citizen of an African country, and South African students will be given preference.

**Scholarship package:**

Funding for this project is not confirmed. However, interested candidates may apply for funding through the NRF or the Water Research Commission (WRC). This is a full-time studentship based at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The candidate will be expected to cover all living expenses including travel to and from the University out of this stipend. All project running costs will be covered through the project budget. Candidate will be expected to find private accommodation, and make own arrangements for medical insurance and study permits if they are an international student. This scholarship is subject to availability of funds within the larger WRC project.

**How to Apply:** Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent project report or publication to [clarkd@ukzn.ac.za](mailto:clarkd@ukzn.ac.za).

**Two MSc Studentships at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**MODELLING THE IMPACTS OF LAND MANAGEMENT SCENARIOS ON WATER QUANTITY AND  
QUALITY**

**Scholarship description:**

South Africa has a rapidly changing landscape. To support a growing population and economy, it is necessary for the country to make increasing changes to the land's surface to ensure adequate economic growth and food production. However, with such rapid and widespread changes in land management, vast changes in natural resource and water availability are inevitable. These large scale land management changes include conversion of areas of natural land to industrial or residential areas, conversion of natural land to crop land, biofuel crops and/or forestry, over-exploitation of grasslands for livestock grazing, introduction of alien invasive species due to human movements and economic activities, unsustainable and/or irregular fire regimes which are detrimental to the ecological health of the system (particularly grasslands and savannas), and misuse and degradation of riparian zones and wetlands which are vital ecological infrastructure. Through a five year Water Research Commission funded project the impacts of these land management changes on water quantity and water quality are to be investigated.

**Eligibility:**

The successful candidate should be driven, disciplined, able to work as a member of a team, and be able to set and meet own deadlines. The candidate is expected to have an Honours degree in hydrology, environmental science or a related discipline. Experience with the ACRU agrohydrological model is a prerequisite, GIS experience is preferable. The candidate must be prepared and willing to undertake field work. Proficiency in English, both verbal and written, is required.

**Scholarship package:**

Funding is available up to R75 000 per year for two years depending on project resources. This is a full-time studentship based at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The candidate will be expected to cover all living expenses including travel to and from the University out of this stipend. All project running costs will be covered through the project budget. Candidate will be expected to find private accommodation, and make own arrangements for medical insurance and study permits if they are an international student.

**How to Apply:**

Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent publication or chapter from honours project to [warburtonm@ukzn.ac.za](mailto:warburtonm@ukzn.ac.za).

**Two MSc/PhD Studentships at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**IMPROVED INFORMATION BASE AND UNDERSTANDING OF AVAILABLE SURFACE AND  
GROUNDWATER**

**Scholarship description:**

This studentship forms part of a larger project under the Southern African Science Service Centre for Climate Change and Adaptive Land Management funded by the German Development Bank and the National Research Foundation and aims to improve the understanding of the impact of global change on water resources and the capacity of society to respond to change.

The first of the offered scholarships (MSc/PhD level) will be focused on the Cathedral Peak catchments and improving the understanding of the contributions to streamflow under various land uses. A grassland catchment, a catchment experiences woody encroachment and a rehabilitated catchment will form the study catchments. Streamflow and climatic monitoring in the catchments resumed in 2012. This project will make use of data already collected, as well as undertaking additional fieldwork and data collection to determine the impacts of the land uses on water flows. Depending on the level of study, the scope of the project will be adjusted.

The second of the offered scholarships (MSc level) will be focussed on the Two Streams catchment, KwaZulu-Natal. The area of commercial forestry in the catchment is scheduled to be harvested in the next months. This project will be focused on determining the impacts of the harvesting on water flows in the first year following felling.

**Eligibility:**

The successful candidate should be driven, disciplined, able to work as a member of a team, and be able to set and meet own deadlines. For application to undertake an MSc, the candidate is expected to have an Honours degree in hydrology, environmental science or a related discipline. For application to a PhD level scholarship, the candidate is expected to have a MSc degree in Hydrology or related discipline. The candidate must be prepared and willing to undertake field work. A drivers licence is a prerequisite. Proficiency in English, both verbal and written, is required.

**Scholarship package:**

The funding for an MSc is available up to R75 000 per year for two years depending on project resources. The funding for the PhD position will be negotiated. This is a full-time studentship based at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The candidate will be expected to cover all living expenses including travel to and from the University out of this stipend. All project running costs will be covered through the project budget. Candidate will be expected to find private accommodation, and make own arrangements for medical insurance and study permits if they are an international student.

**How to Apply:**

Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent publication or chapter from Honours project or MSc dissertation to [warburtonm@ukzn.ac.za](mailto:warburtonm@ukzn.ac.za).

**MSc Studentship at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**IMPROVING THE UNDERSTANDING OF THE CONTRIBUTIONS TO STREAMFLOW FROM VARIOUS  
SOURCES IN THE CATHEDRAL PEAK RESEARCH CATCHMENTS**

**Scholarship description:**

In a previous WRC (K5/2236) undertaken at Cathedral Peak warming trends in the temperature records were detected as well as decreasing trends in the streamflow records, however no statistically significant changes in precipitation records were observed. This raised questions around the contributions to streamflow from the various flow sources and the role of groundwater. Given the importance of the headwater catchment areas, such as the Cathedral Peak research catchment, to the water resources of KwaZulu-Natal, Gauteng and the surrounding communities it is important to further the understanding of process and contributions to streamflow, and how these may change into the future. A proposal for a three year project has been submitted to the Water Research Commission funded to undertake this improved process understanding.

**Eligibility:**

The successful candidate should be driven, disciplined, able to work as a member of a team, and be able to set and meet own deadlines. The candidate is expected to have an Honours degree in hydrology, environmental science or a related discipline. The candidate must be prepared and willing to undertake field work. A drivers licence is a prerequisite. Proficiency in English, both verbal and written, is required.

**Scholarship package:**

Funding is available up to R75 000 per year for two years depending on project resources (**PLEASE NOTE:** Funding for this project is not confirmed). This is a full-time studentship based at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The candidate will be expected to cover all living expenses including travel to and from the University out of this stipend. All project running costs will be covered through the project budget. Candidate will be expected to find private accommodation, and make own arrangements for medical insurance and study permits if they are an international student.

**How to Apply:**

Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent publication or chapter from honours project to [warburtonm@ukzn.ac.za](mailto:warburtonm@ukzn.ac.za)

**Honours / MSc / PhD at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**UNDERSTANDING HYDROLOGICAL RESPONSES AND SOCIO-ECONOMIC INFLUENCES IN ORDER TO  
FACILITATE INTEGRATED AND ADAPTIVE WATER RESOURCES MANAGEMENT**

**Scholarship description:**

Impacts of global change are increasingly felt by communities, especially those that are already vulnerable to other issues of change and who lack good governance. This is specifically true in the Sub Saharan context. IWRM and AM have been promoted to ensure the well-being of communities and sectors. However, how impacts unfold and shape livelihoods of all types of communities including the influence of the spatial and urban setting they live in, is lacking scientific understanding. Even less research has been done on including lived experience into intervention design and how to mainstream such an approach into decision-making.

The latter two factors have been identified as a gap in the past as well as the current research arena and the CWRR related interest in this regard would be on investigating these issues case specific in the context of climate change adaptation, water security and water poverty.

Research envisaged under this theme could involve:

- a) understanding different types of vulnerability
- b) creating catchment-tailored adaptation management plans that reflect specific needs,
- c) identifying biophysical and / or socio-economic drivers,
- d) identifying hydrological information that is key for water planning and management,
- e) developing indicators for good water resources management on a catchment scale (e.g. the Mgeni catchment)
- f) and many others.

**Eligibility:**

The successful candidate should be driven, disciplined, be capable to work as a member of a team, and be able to set and meet own deadlines. The candidate is expected to have a background in hydrology or environmental science. The candidate should possess a valid driver's license. Proficiency in English, both verbal and written, is required.

**Scholarship package:**

The successful candidate should be driven, disciplined and be able to work as a member of a research team as well as to set and meet deadlines. The candidate must be prepared and willing to undertake field work and thus, a drivers licence is a prerequisite. Proficiency in English, both verbal and written, is required. Verbal proficiency in Zulu would also be an advantage.

**How to Apply:**

Email an expression of interest identifying a theme or topic, including your CV (with at least three traceable references), academic record and if applicable a sample of your writing in the form of a recent publication or chapter from an Honours project to: [stuart-hills@ukzn.ac.za](mailto:stuart-hills@ukzn.ac.za).

**MSc, PhD or Post-Doctoral Opportunities at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**WATER USE AND YIELD OF STRATEGIC BIOFUEL CROPS**

**Scholarship description**

The research involves the measurement of water use and yield of strategic biofuel crops with particular focus on grain sorghum and soybean. Field work will be conducted at a commercial farm (Baynesfield Estate) environment, as well as at the small-holder farm scale (*e.g.* Swayimane). Research undertaken by the candidate will be used to parameterise both a hydrological model and a crop yield model. Simulated output from the crop model will also need to be validated against observed yield data. There is a wide scope of research required, which allows the candidate to choose a particular topic of interest to focus on. This is a full-time MSc position based at the Pietermaritzburg campus of the University of KwaZulu-Natal.

**Eligibility**

The successful candidate should be driven, disciplined and be able to work as a member of a research team as well as to set and meet deadlines. The candidate is expected to have an Honours degree (or equivalent 4-year degree) in crop science, agronomy, hydrology, environmental science or a related discipline. Experience in agricultural/hydrological modelling would be advantage. The candidate must be prepared and willing to undertake field work and thus, a drivers licence is a prerequisite. Proficiency in English, both verbal and written, is required. Verbal proficiency in Zulu would also be an advantage. No candidates over the age of 35 will be considered.

**Scholarship package**

Both PhD and MSc students are encouraged to apply with competitive funding offered, but dependant on, *inter alia*, the available budget and other project resources. All project-related expenses, including field monitoring equipment as well as travel to/from the University will be covered by the project. The candidate will be expected to find private accommodation and cover all living expenses including travel to/from the University out of this stipend.

**How to Apply**

Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent publication or chapter from your Honours project to [kunzr@ukzn.ac.za](mailto:kunzr@ukzn.ac.za).

**Application deadline:** 30 November 2016. **Start date:** 1<sup>st</sup> February 2017

**Honours, MSc and PhD Studentships at the University of KwaZulu-Natal  
Centre for Water Resources Research**

**THE USE OF REMOTE SENSING AND EARTH OBSERVATION FOR ESTIMATING COMPONENTS  
OF THE WATER CYCLE**

**Scholarship description:**

Remote Sensing and Earth observation technologies for estimating rainfall, ET and soil moisture are fast becoming an alternate to conventional methods of measurement due to the larger spatial and temporal resolutions. These datasets offer new opportunities for hydrological modelling, flood and drought prediction, water use estimation and decision making for water resources management. However, there is a need for validation of these types of datasets. Opportunities exist for research into the broad areas of satellite based rainfall and new products, ET and energy balance models as well as remotely sensed soil moisture estimates for use in hydrological modelling and water resources management.

**Eligibility:**

The successful candidate(s) should be focussed, disciplined, able to work as a member of a team, and be able to set and meet deadlines. Proficiency in English, both verbal and written, is required. An MSc candidate is expected to have a BSc (Hons) degree in hydrology/environmental sciences or a BSc Eng degree in a related discipline or the Honours candidate is expected to have a BSc degree in hydrology. For funding, candidates need to be South African citizens eligible to apply for NRF/SANSA or self-funded students are welcome to apply.

**How to Apply:**

Contact Ms. Chetty: [chettyk@ukzn.ac.za](mailto:chettyk@ukzn.ac.za).

**Three MSc and Two PhD Studentship at the University of KwaZulu-Natal  
Centre for Water Resources Research**

- 1) **M.Sc/Ph.D** - Fisheries of the upper uMgeni River catchment including Springrove, Midmar and Albert Falls Dams. Emphasis on fish community structures of the catchment (diversity and wellbeing) and river/lake processes including succession of communities in the dams and migration linkages.
- 2) **M.Sc** – Diversity and threats to the Chubby head fishes of upper Thukela, Umgeni and rivers of Southern KwaZulu-Natal. Scope includes sampling of fishes throughout the region as a part of the River Health Programme study. Collection of specimens and genetic and morphometric work and rapid risk assessment of threat to wellbeing of fishes.
- 3) **M.Sc/Ph.D** - Evaluation of the socio-ecological consequences of altered flows in the lower Thukela River and Estuary.

**Eligibility:**

The successful candidate should be driven, disciplined, able to work as a member of a team, and be able to set and meet own deadlines. For application to undertake an MSc, the candidate is expected to have an Honours degree in hydrology, environmental science or a related discipline. For application to a PhD level scholarship, the candidate is expected to have a MSc degree in Hydrology or related discipline. The candidate must be prepared and willing to undertake field work. Candidate needs to be a citizen of an African country, and South African students will be given preference. Proficiency in English, both verbal and written, is required.

**Scholarship package:**

Funding of up to R75 000 for MSc and up to R120 000 for PhD is potentially available for full time students, dependent on available project funds. This is a full-time studentship based at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The candidate will be expected to cover all living expenses including travel to and from the University out of this stipend. All project running costs will be covered through the project budget. The candidate will be expected to find private accommodation, and make own arrangements for medical insurance and study permits if they are an international student.

**How to Apply:**

Email your CV (with at least three traceable references), academic record and a sample of your writing in the form of a recent project report or publication to [Obrieng@ukzn.ac.za](mailto:Obrieng@ukzn.ac.za).

**PHD/MSC RESEARCH AT THE UNIVERSITY OF KWAZULU-NATAL  
CENTRE FOR WATER RESOURCES RESEARCH**

**WATER RESOURCES IMPACTS OF CLIMATE CHANGE IN SUB-SAHARAN AFRICA**

**Scholarship description:**

The Centre for Water Resources Research is a member of the UMFULA research consortium. This initiative will provide new insights and more reliable information about climate processes and extremes, their impacts on water resources, crop yields and the associated societal risks and opportunities in Central and Southern Africa. It aims to create a step change in scientific understanding of Central and Southern Africa's climate – and how the climate and responses it drives will change in the 5–40 years ahead. To ensure the information is relevant for decision-making, the team will work closely with development partners in the water, agriculture and energy sectors in the Rufiji river basin in Tanzania and at the subnational level in southern Malawi. The team will produce scenarios for the climate in the decades ahead, including the effects of 'high impact' events like intense rainfall and droughts, on natural resources and socio-economic activities. This will highlight the trade-offs that decision-makers face in the context of uncertain future climate and rapid economic change. The project aims to provide support to planning for resource use, infrastructure investments and sectoral growth priorities, by identifying adaptation pathways which are robust and resilient in the face of climate change and other non-climate stressors.

The CWRR role is to model the hydrological and related water resources impacts of the future climate scenarios generated by consortium partners and to integrate these with the research of other team members and needs of stakeholders. We seek MSc and PhD students who are interested in the aspects below. The work will be done in close collaboration with a PostDoc already working on the project.

**Aspects of the study:**

- Set up and implement a daily time-step hydrological and agricultural yield model(s) in the lower-Shire catchment in Malawi including collation and collection in the field of all necessary hydrological and meteorological data.
- Simulate current and future water resources and yields of key agricultural crops in the catchment using climate change scenario information provided by project partners.
- Contributions to and authorship of top-quality peer reviewed manuscripts in leading journals.

**Eligibility:**

The successful candidate should be driven, disciplined, able to work as a member of a team, and be able to set and meet his/her own deadlines. The candidate is expected to have an appropriate degree in hydrology, environmental science, engineering or a related discipline. Proficiency in English, both verbal and written, is required. We seek applications from enthusiastic and committed individuals who are willing to travel within the region. Opportunities to spend time at international participating organisations also exist.

**Scholarship package:**

A stipend in line with CWRR scholarship norms is offered. This is a full-time studentship based at the Centre for Water Resources Research ([cwrr.ukzn.ac.za/](http://cwrr.ukzn.ac.za/)) at the Pietermaritzburg campus of the University of KwaZulu-Natal ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The candidate will be expected to cover all living expense and personal travel from this stipend. All project travel and running costs will be covered through the project budget.

**MSc/PhD/Postdoc Studentships at the University of KwaZulu-Natal**  
**Centre for Water Resources Research**  
**LAND, WATER AND ECOSYSTEM GOODS AND SERVICES**

**Scholarship description:**

Land, soil and water resources and the production of goods and services upon which society depends are intimately linked. In developing countries, society is largely dependent upon the land for its survival, but the production of food and fibre and the land on which this takes place is subject to huge pressure due to a growing demand, both nationally and internationally. Rapid changes in land use and a corresponding degradation of soil and water resources are the result and thus, a decline in the benefits to society.

The overall objective is to develop methods which contribute to the sustainable functioning of river and rivers and to contribute to the development of a framework and strategy to guide investments in rehabilitating and maintaining key catchment areas (i.e. ecological infrastructure) in order to ensure water security (in terms of both water quality and quantity), and to assess the viability (including financial) of the inclusion of the concept of ecological infrastructure in decision-making and policy development nationally.

In pursuing this aim, the following aspects are intended:

- Methods for mapping water security related ecological infrastructure and assessing ecosystem condition in catchments are assessed and refined.
- A framework for the prioritisation of sites and types of intervention/rehabilitation that hold the greatest potential to enhance water-related service delivery and water security is developed.
- Interactions between hydrology and society are understood.
- A hydrological modelling system that is capable of water quality and quantity simulations for the catchment(s) is established.
- Baseline data and monitoring and evaluation approaches required to be able to assess outcomes of the interventions are identified and monitoring is initiated.
- Policy-relevant lessons are extracted and fed into key policy processes.

Contributing to various ongoing projects and forming part of a research team working on these themes, there are full time positions for Hons, Masters, PhD and PostDoc positions based at the Pietermaritzburg campus of the University of KwaZulu-Natal under the supervision of the Umgeni Water Chair of Water Resources Management.

**Eligibility:**

The successful candidates should be self-driven, disciplined, able to work as a member of a team, and be able to set and meet their own deadlines. The candidate(s) are expected to have a BSc (Hons), MSc or PhD degree in hydrology, environmental science, engineering or a related discipline in line with qualification for which they are applying. Experience in hydrological modelling and GIS and/or remote sensing tools will be a strong advantage, but applications from students with a background or interest

in resource economics and social science are also welcome. Proficiency in English, both verbal and written, is required.