Carnegie Rise
SSAWRN

Sub-Saharan Africa Water Resources Network

Denis Hughes
Institute for Water Research
Rhodes University

SSAWRN Nodes:

- Makerere University, Uganda:
  - Faculty of Veterinary Sciences & Makerere Water Network (Prof Michael Ocaido).
- University of Botswana:
  - Okavango Research Institute (ORI – Prof Wellington Masamba).
- Eduardo Mondlane University, Mozambique:
  - Department of Geology (Prof Elonio Muiuane).
- Rhodes University, South Africa:
  - Institute for Water Research (Prof Denis Hughes).
  - Secretariat (Dr Sukhmani Mantel).

Primary Objectives of SSAWRN

- Build research capacity in water resources science within Sub-Saharan Africa.
- Focus on the development of post-graduate students.
- Retain research capacity within the region.
- Diverse disciplines related to water resources.
- Ultimately contribute to improved capacity for water management in the region.

Current status of SSAWRN students:
Rhodes, IWR: Hydrology

Student	Start Year	Degree	Topic	Status
Raphael Tshimanga	2009	PhD	Uncertainty analysis and scenario-based stream flow modeling for the Congo River Basin.	Awarded 2012
Sithabile Tirivarombo	2009	PhD	Climate variability and change in water resources management of the Zambezi River Basin.	Awarded 2013
Jane Tanner	2009	PhD	Assessment of the surface and ground water interaction components of the Pitman rainfall-runoff model.	Completed; graduate 2014
Thabiso Mohobane	2011	PhD	Impacts of climate change on water resources.	Submit in 2014
Sbongiseni Mazibuko	2011	MSc	Application of remote sensing in hydrological modeling.	Submit in 2013

Rhodes, IWR: Environmental Water Quality

Student	Start Year	Degree	Topic	Status
Francis Arimoro	2009	Post-Doc	Developing a bioassessment protocol for Nigerian streams.	Returned to Nigeria 2010
Nelson Odume	2009	MSc	Chironomidae larval deformities as indicators of anthropogenic impacts in the Swartkops River.	Awarded 2011 (Distinction)
Nelson Odume	2011	PhD	Novel approaches to reducing the ecological risk associated with selected persistent organic pollutants in South African surface waters.	Expected to submit Nov. 2013
Paul Mensah	2009	PhD	Development of *Caridina nilotica* life-cycle toxicity test protocol in order to derive water quality guideline for Roundup herbicide in South Africa.	Awarded 2013
Boluwaji Onabolu	2010	PhD	A risk assessment of drinking water quality deterioration from source to point of use, its public health impact and governance.	Completed; graduate 2014

Okavango Research Institute

Student	Start Year	Degree	Topic	Status
Kondja Amutenya	2009	MPhil	The effects of water quality on fish growth rate in the Okavango Delta, Botswana.	Writing; In Namibia (2013/2014?)
Moseki Motsholapheko	2009	PhD	Rural Livelihoods and Household Adaptation to Flood Variability in The Okavango delta, Botswana.	Graduated 2013
Nqozibetha Siziba	2009	PhD	The dynamics of micro-invertebrates and their relevance to early life stages of fish in the temporary floodplains of the Okavango Delta, Botswana.	Graduated 2013
Gaolatlhe Tsheboeng	2009	PhD	Responses of seasonal floodplain vegetation communities and soil nutrient status to flood variation in the Okavango Delta, Botswana.	Graduated 2013
Richard Mazebedi	2011	PhD	Water quality monitoring and development of a biomonitoring tool in Thamalakane river using aquatic macro-invertebrates.	Part time; Submit 2014
Kraposy Kujinga	2011	PhD	An analysis of factors of water insecurity in the Okavango Delta: Case studies of Shorobe and Tubu.	Submit end 2013
Kelebogile Cole-Mpho	2010	MPhil	Flooding and nutrient mineralization in a seasonal floodplain of the Okavango Delta, Botswana.	Submitted
Kudzanai Chipiso	2011	MPhil	An investigation of trace metal pollution in water around the Okavango Delta: Water quality	Withdrew in 2011
Gosaitse Tubatsi	2011	MPhil	Water quality and diarrhoeal diseases along the Thamalakane-Boteti River systems.	Submitted
Bame Sanah Keabetswe	2012	MPhil	Heavy metal chemistry in a recharge island of the okavango delta	Submit 2014

Makarere University

Student	Start Year	Degree	Topic	Status
Irene Naigaga	2009	PhD	Use of bioindicators and biomarkers to assess aquatic environmental contamination.	Graduated 2013
Irene Naigaga	2011	Post-Doc	Assessment of endocrine disrupting compounds in Murchison Bay, Uganda.	Retained as staff member
Joseph Orume	2009	Post-Doc	Sources of water-borne disease microbes contaminating Lake Victoria, Uganda.	Retained as staff member
Justine Ekou	2009	MSc	Molecular epidemiology of *Entamoeba histolytica* as a contaminant of water.	Graduated 2013; Retained as staff member
Sehnte Celsus	2011	PhD	Eco-hydrological factors playing a role in the epidemiology of Anthrax in Queen Elizabeth Conservation Protected Area, Uganda.	Complete in 2014
Elias Kaburuku	2011	MSc	Characterisation of water quality of river Rwiizi using biological indicators.	Complete in 2013

Eduardo Mondlane University

Student	Start Year	Degree	Topic	Status
Agostinho Vilanculos	2009	PhD	Improving multireservoir system operation using hydrologic information in the Zambezi River Basin.	Complete in 2013
Pedro Timba	2009	MSc	Hydrogeological characterization and the problem of groundwater exploration in Mozambique	Graduation Oct/ Nov 2013
Venancio Taimo	2011	MSc	Geohydrology	Complete in 2013
Alcino Nhacume	2011	MSc	Surface and groundwater interaction modelling.	Complete in 2013
Edigio Govate	2009	MSc	Hydrogeological characterization and vulnerability analysis of aquifers in the Zambezi Basin	Graduation Oct/ Nov 2013

Agostinho Vilanculos is registered at Rhodes University and jointly supervised by Prof.'s Muiuane and Hughes.

Summary

Category	MSc/MPhil	PhD	Post-Doc
Awarded/Completed	4	9	3
Under Examination	2		
Expected end 2013	4	3	
Expected end 2014	2	3	
Totals	12	15	3

Conclusion is that we are 'more-or-less' on track:

There is a need to ensure that those that started before 2011 complete their programmes and submit their theses as soon as possible.

Key Achievements:

- Most student projects have progressed satisfactorily.
- Approx. 50% have completed.
- Some students have managed to attract co-funding from a variety of sources.
- Student attendance at recent conferences:
  - SANCIAHS, 2011:
  - WATERNET, 2012 & 2013: RISE students have/will presented papers at this major regional conference.
  - Participation in several other regional and international conferences.
- 32 scientific papers have been published and 60 presentations made at scientific meetings.

Future career paths:

- Objective was to retain some students as faculty members or research staff:
  - Several students have taken up academic positions.
    - Lectureships & Post-Doc Fellowships.
    - Applies to all nodes.
  - Need to identify further funding opportunities for developing future careers of graduates.
  - Need to assist the students to develop links with international partners.
  - Need exposure to, and participation in regional and international cooperative projects.

Example Success: Dr Raphael Tshimanga

- Deputy Head
  - Hydrology & Water Resources, Dept. Natural Resources Management, University of Kinshasa.
- Leader of initiatives on Congo River hydrology & water resources.
- Participant in World Bank study of several large African river basins.
- Prospective co-supervisor of Phase 3 PhD student.

Example success: MSc course at EMU

- RISE used to initiate new course-work MSc programme at EMU in geohydrology:
  - Rehabilitation of the facilities of the Department of Geology are complete.
  - New MSc programme is expected to start in Sept. 2013.
  - Expected that all basic teaching and research equipment will be installed and functional by then.
  - RISE students have assisted in the preparation of teaching material.
- UNU Flores to be launched at EMU in 2016.

Example success: Moseki Motsholapheko

- Originally a technician at ORI.
- Identified as a potential academic.
- Started PhD programme and awarded degree in 2013.
- Now an established research scholar at ORI
  - Editing a book on 'Flooding, risk factors and management' in Botswana.

Example success: Joseph Orume & Irene Naigaga

- Dr Orume
  - Originally post-doc at Makerere.
  - Appointed as a Professor in Microbiology.
  - Supervising PhD student.
- Dr Naigaga
  - Former PhD
  - Post-doc and applied fro senior lectureship.

Dissemination:

THE WATERWHEEL

ISSN 0258-2244 September/October 2013 Volume 12 No 5

(RISE)ing up for water education in Africa

Africa's water challenges calls for the continent to develop its own skilled body of expertise. Sukhmani Mantel and Denis Hughes introduce one academic network that is aiming to do just that.

A student from the Institute of Water Research undertaking invertebrate sampling.

The development of solutions to sub-Saharan Africa's water resource problems is currently hindered by a shortage of trained personnel, especially at high levels of academic and professional expertise. This gap is frequently filled by consultants from outside the region, who may contribute to the solution of specific problems, but do little to contribute to longer-term development of capacity within the region.

With this need in mind, the Sub Saharan Water Resources Network (SAAWRN) was launched in 2008 with funding from the Regional Initiative in Science and Education (RISE) programme of the Carnegie Corporation of New York. The programme is aimed at strengthening higher education in the science and engineering fields by increasing the number of skilled Doctorate and Masters persons in Africa. The network is one of five African networks funded by the Carnegie Corporation.

SAAWRN's focus has been on fundamental and applied science that can contribute to solutions to the diverse problems facing the region in terms of securing adequate (in terms of quantity and quality) water supplies that are environmentally sustainable. There are many water-related pressures facing the region, including declining observation networks (and therefore a decline in the information available for management), declining human capacity, increasing resource use, and the very real possibility of increasing resource variability associated with future climates.

As the region strives toward improving both political and economic stability, the importance of providing secure water supplies will assume increasing significance. If this is neglected, there is the potential for conflicts within communities (through a lack of water and sanitation services provision) as well as between countries (through a lack of agreement on transboundary sharing of water resources).

Prof Denis Hughes (Director of the Institute of Water Research or IWR at Rhodes University) is the Academic Director of SSAWRN, a network that comprises four university nodes. Besides IWR, the other three institutions are the Okavango Research Institute at the University of Botswana, Department of Geology at Eduardo Mondlane University in Mozambique, and the School of Veterinary Medicine and Animal Resources at Makerere University in Uganda.

RESEARCH AREAS AND GRADUATES

Water resource science should be seen as a multi- and interdisciplinary science that addresses the problems and issues associated with managing water resources, including surface and groundwater quantity, water quality and related ecological dependencies, water use and its management. There are many research opportunities in the field of water resource science within sub-Saharan Africa, covering many basic disciplines, including civil engineering, geography, hydrology, ecology, water chemistry, geology and environmental science.

The students at SSAWRN are conducting projects that are aligned to applied research, and that address the solutions to identified socio-economic problems affecting various countries, thus creating a bridge between academia and society. In the past five years, the network has recruited 27 students (and three post-doctoral students) from ten different African countries. A total of seven PhD students and six MSc students have graduated in the disciplines of hydrology, water resources science, natural resource management and hydrogeology.

NETWORKING: OPPORTUNITIES AND LIMITATIONS

Some of the benefits that the students and the institutions have derived by being part of a network include growth in the profile of indigenous African research in the field of water resources, largely through the outputs of the students, as well as successful applications to other funding bodies. The latter has allowed the students to expand the resources available to them to complete their studies and launch their careers.

The students also benefit from disseminating research ideas and results at regional and international conferences and workshops. This contributes to their academic confidence, increases their exposure to other scientists and boosts the reputation of their host institutions. Finally there is the sharing of research, resources and co-supervision of students, which have fostered a multi-disciplinary approach to water resource science research.

The SSAWRN has encountered some limitations that are being addressed where possible. Some of these present lessons for other water institutions. As examples, the broad subject scope of the students projects and the limited number of available supervisory staff has limited cop-supervision possibilities across the network nodes, primarily due to the small numbers of experienced supervisors, who already have heavy workloads. The high costs of travelling within the region are a major stumbling block in bringing supervisors and students together more than once or twice a year.

Language barriers have also limited co-supervision possibilities for students from French or Portuguese speaking countries. Some of the students have identified the need for additional short training courses at the start of their studies to fill any gaps in their academic skills. The diverse standard for training across Africa makes this particularly problematic for students registering for a thesis-based postgraduate degree. In this regard, there are two taught masters programmes that will be commencing over the coming year at Eduardo Mondlane University and Rhodes University that offer advanced disciplinary and transdisciplinary courses, short courses on postgraduate research and writing, and address issues of language (where possible).

FUTURE OF THE NETWORK AND STUDENTS

The majority of the network graduates have joined universities as post-docs or departmental staff members in Democratic Republic of Congo, Uganda, Zimbabwe, Mozambique, Botswana and South Africa. There is continued networking between some of the graduates that have returned to their home countries.

Following the six years of RISE funding, the SSAWRN network will be entering the final phase of its three-year funding by the Carnegie Corporation in 2014, and more graduates will be joining the ranks of academics, researchers and practitioners in the near future as a realisation of the network's vision. ❑

Future plans:

- Support for existing students.
- Course-work MSc in Water Resources Science at Rhodes University.
- Integrating theme for Phase 3:
  - Large African Wetlands – hydrology, landscape, ecology, sustainability, land use & human settlement.

Existing students:

- Committed to supporting existing students to finalise their post-grad programmes as far as possible.
- Will be achieved out of savings largely related to exchange rate fluctuations.

Course-work MSc at Rhodes

- Water Resources Science – modular course:
  - Noted that not all students ready to do post-grad. programmes by research only.
  - Links to proposed UNESCO Category I Centre (water resources) in the Eastern Cape Province.
- Intended to start in 2014.
- Rhodes made provision for new staff member:
  - However, not able to find a suitable candidate.
  - Problems with limited contract length.
- Not able to go ahead with plans at this stage.

Large African Wetlands

- Integrating theme:
  - Across disciplines – hydrology, ecology, landscape, human interactions, transdisciplinarity, etc.
  - Across Nodes.
  - Links to other groups:
    - Possibility of co-funding.
    - UK group working on large river geomorphology.
    - Expanding network within SS Africa (e.g. Kinshasa Univ.).
- Identifying possible parallel student projects:
  - Links between hydrology & landscape form.