

Water research in Tanzania and Bolivia

“A nation’s
development
depends on its
water resources
and how they
are managed”

Doing research in the IUC programme with *Universidad Católica Boliviana (UCB)*, PhD student *Afnan Agramont* is very much aware of the importance of water. “Water is crucial for the future of humanity,” he stresses. Since the eighties, population growth, socio-economic development and changing consumption patterns have increased water use worldwide by about 1%. Good water management is key to maintain a country’s water resources in the face of numerous challenges, not least climate change and population growth. This is a story on how VLIR-UOS is committed to supporting research on one of the most critical resources for human development.

Water research in Bolivia tailored to the region

In 1999, the inhabitants of the Bolivian city of Cochabamba hit the streets during the so-called ‘Cochabamba Water War’ after the government privatised the city’s water. This resulted in skyrocketing water prices for its population. In 2016, Bolivia

faced its worst drought in 25 years, which led to the declaration of a state of emergency in the country. Over the past twenty years, Bolivia has faced various water challenges, such as droughts and poorly managed water resources. Within the IUC programme with UCB, *Marijke Huysmans*, professor at Vrije Universiteit Brussel (VUB) and other researchers aim to tackle some of the country’s most

pressing water issues, such as groundwater provision and social and political water management. “We work in four different regions in Bolivia, each with very different and specific needs,” Huysmans explains. “In the Santa Cruz region we do research on groundwater, in La Paz we look at social and political water management, in Cochabamba we work on water accounting and model development for the sustainable management of water resources, and in Tarija we research water quality.”

Research on water pollution from Tarija to Lake Titicaca

PhD student Agramont takes part in the La Paz research project at UCB. At the Katari River Basin, he explores possible approaches to control the pollution in the river basin and attain a more sustainable use of the region’s water resources. “The Katari River is heavily polluted because of urban, industrial and mine discharges,” Agramont explains. “The pollution has a severe environmental impact on the Titicaca Lake, the second biggest lake in South America and the largest water reservoir in the Andes region. Apart from the environmental



Marijke Huysmans (in the middle) is involved in the IUC programme at Universidad Católica Boliviana.



PhD student Afnan Agramont takes part in the La Paz research project at Universidad Católica Boliviana.

“So far, we have been able to collaborate with the river basin authorities to install a water quality monitoring network,” he says.

Bottom right photo: Vicente Burchard observing crop growth parameters © Muggaga Monica Nsali

effects, communities that rely on the ecosystem services provided by the lake for their living come under a great deal of stress.”

Although the project has only been running since 2017, Agramont already notices some effects. “So far, we have been able to collaborate with the river basin authorities to install a water quality monitoring network. This collaboration has allowed us to implement three water quality monitoring campaigns so that we have more information on how to better manage contamination within the entire system.”

The UCB also co-organised the first International Congress of Integral Water Management in October 2019, including 50 lectures, 350 participants, and panels with experts from fourteen countries. At these lectures, the project team

from the IUC presented nine papers. An article on involving vulnerable social groups in solving complex water-related problems in Bolivia has also been published in an international indexed journal. Additionally, water laboratories in La Paz, Cochabamba and Tarija have been accredited as inspection bodies for natural water quality for the national Bolivian metrological institute (*Instituto Boliviano de Metrología*).

Huysmans is also seeing the academic and societal impacts throughout the entire project. “Within the university, our project has received particular attention – it has created greater awareness. Water has become a major theme in the students’ Bachelor papers, dissertations and internships,” she explains. “The university has stronger

connections with several NGOs, cooperatives that provide drinking water and governmental organisations.” This is important because a big network helps to share information from the research beyond the boundaries of the university. It helps to build bridges between the academic world and society, to apply research results, translate research findings into practice, give feedback on research findings, and more.

Tanzania: Pangani Basin’s water under pressure

In another VLIR-UOS partner country, Tanzania, water availability is crucial for agriculture, but supplies are under pressure. In a 2017 report, the Food and Agriculture Organization of the United

“
The water use is very high, but the water productivity is relatively low.

Nations pointed to the agricultural sector as key to overall economic growth and development in Tanzania. The sector accounts for about 66.9% of employment, 29% of GDP and 30% of exports.

“Many farmers living in the Upper Pangani River basin, one of Tanzania’s most important water resources in the north-east of the country, make intensive use of the river’s water to set up irrigation canals for their agriculture,” says **Ann van Griensven**, researcher at VUB and Flemish project promoter within the IUC programme at the Nelson Mandela African Institution of Science and Technology (NM-AIST). “The water streaming down from the mountains is tapped for irrigation with no water left for other users further down the river.”

The intensive water use already puts severe stress on water supply, but there are other threats. Farmers often use traditional, unsustainable agricultural practices that contribute to water

stress and land degradation. Furthermore, land is degraded as well. Climate change also puts a strain on water use as it is causing the Kilimanjaro glaciers to melt. Although melting glaciers will increase streamflow initially, this effect will wear off in the long run and will result in less capacity to store precipitation

and eventually in less water availability. Despite these threats to the basin’s water, a lot of farmers are unaware of how much water they are actually using and if they are using it at all efficiently. “The water use is very high, but the water productivity is relatively low,” says van Griensven. The higher the water productivity, the more crops a farmer gets as output for his or her water consumption input. Using as little water as possible for a crop production that is as high as possible is therefore the main goal for the Catholic University of Leuven (KU Leuven) and the NM-AIST as part of their long-term IUC cooperation which started in 2013. The researchers aim to improve how the Pangani basin’s water is allocated





Monitoring of irrigation flows in Tanzania
© Muggaga Monica Nsali

and managed. The project wants to develop expertise in the field of hydrology and integrated river basin management at NM-AIST, as well as contribute to improved allocation and management of water resources in the Upper Pangani Basin in particular. Gathering data on surface water (water in lakes, rivers and canals) and groundwater (water in the soil), the teams investigate how different land use decisions and climate change will impact hydrological systems, and assess the water that the ecosystem demands. “With this project, we mainly try to quantify water use,” says van Griensven. “We are now mapping irrigation systems and agricultural practices. That way, we get a better idea of when and where there is

irrigation, what quantities of water are used and what revenues farmers get from using those quantities.” The researchers summarise their findings in an ‘integrated spatial model’, in which the distribution of water resources now and in future scenarios is shown. Several aspects are taken into account in this model: it shows all water demands from both people and ecosystems, indicates water quantity and quality, makes connections to land use and spatial planning and takes population growth, climate change and land use change into account.

Uncharted waters

After six years of hard work within the IUC programme, some impacts can already

be seen. Research from the PhD project was accepted for presentation at international conferences and published in international journals. There are now facilities for laboratory work and data analysis at NM-AIST, with the laboratories fitted with state-of-the-art equipment. Furthermore, the project has laid the foundations for other important projects, for example the development of a World Bank project. Most third party-funded projects in the NM-AIST science departments were to a large extent the result of the VLIR-UOS IUC programme.

Plans for having the research find its way to local farmers are ready. “Once all results have been analysed, newly-developed water productivity maps – on agricultural water productivity among others – will be diffused via a stakeholder meeting,” says Van Griensven. One of these stakeholders is the Pangani Basin Water Office, which is responsible for allocating water for different uses, managing and controlling water use, and creating awareness on how to use water effectively and efficiently.

“We will also spread the knowledge to regional agricultural extension officers (editor’s note: go-betweeners for researchers and farmers to communicate the research findings) and NGOs in the sector, so that they can communicate these improved practices to farmers. A team member sat together with

these officers to talk about how the uptake of knowledge can be improved. Furthermore, we will create information sheets to exchange with them.”

ICP IUPWARE

True impact and change has also come about in another way, namely in the form of the International Master Programme (ICP) IUPWARE, which stands for ‘Interuniversity Programme in Water Resources Engineering’. This interuniversity Master programme between VUB and KU Leuven consists of various courses such as ‘groundwater and surface water hydrology’, ‘environmental programming’, ‘water resources management’ and an ‘Integrated Project’ which is jointly organised with a partner institute from the South.

“The ICP IUPWARE is a programme with a lot of impact, because we train people from partner countries in integrated water management, modelling, data processing, and so on,” says Van Griensven. “They then use this knowledge in their careers, go and work in academia or at ministries in their home countries, where they apply the knowledge acquired to water research or management. Alumni work for, among others, the University of Western Cape, Addis Ababa University and several positions at various ministries of Water, to the level of minister (e.g. in Bolivia). This capacity

building via education is very important.”

For the future of humanity

Agramont’s motivation for his research summarises the importance of water in a country’s development. “Climate change, increased agriculture, changing consumption practices and population growth are exerting alarming pressure on water resources,” he says. “These pressures can cause local, regional and international conflicts as well as environmental impacts. Our research can be used to improve water management practices, and to counter the impacts of these social and environmental threats. Knowing this is the greatest motivation for me,” he concludes.

**“Since I was eight years old,
I wanted to be an ecologist”**

Silvana Fajardo graduated from the Master of Ecological Marine Management (EcoMaMa) at Vrije Universiteit Brussel in 2007 and is now an environmental specialist in a team in charge of the National Adaptation Process for Peru on climate change in fisheries and aquaculture. During her career, she has attached a lot of importance to preserving oceans, managing marine ecosystems and advocating for cleaner oceans and climate change solutions.

“Since I was eight years old, I wanted to be an ecologist. I therefore decided to study Fishing Engineering at first, but I wanted to do something with marine biology and conservation as well. In the last year of my Bachelor in Fishing Engineering, I did an internship in the fishmeal and fish oil industry. Seeing all the pollution impacting the sea, I got really motivated to take better care of the ocean. In all those years of studying, I had learnt a lot about the ocean, but not about how to take care of it and how to prevent its pollution. At the time, in 2006, when finishing my Bachelor Degree in Lima, we didn't have any marine preservation programmes or study fields



in Peru, however. That is why I applied for the EcoMaMa Master in Belgium, where I learned about marine biology and environmental assessments. Following my graduation, I did a traineeship at the European Parliament Fisheries Department. There, I assisted the policy department for structural and cohesion policies, conducted background research on fishmeal and fish oil and attended regular European Parliamentary Committee Sessions. As a consultant at the Peruvian Ministry of Environment, I have produced two marine ecosystems management reports on the Peruvian marine-coastal ecosystem. I also did a United Nations (UN) project on the Humboldt Current (editor's note: cold-water current of the southeast Pacific Ocean, with a width of about 900

kilometres) in which I did a study of the Humboldt marine ecosystem's health as a pollution and ecosystem health specialist consultant. I tried to have the Humboldt Current Large Marine Ecosystem project advance towards sustainable use and resilience so that the ecosystem services would be kept intact for current and future generations despite any potential climatic and social pressures.

I also participated in the UN COP20 (20th Conference of the Parties) in Lima in 2014 on the topic of sustainable cities.

We organised a Climate Change Fair and met with key stakeholders on the subject: institutions, NGOs and public and private agencies in search of coalition efforts for a future agenda on sustainable cities. We also organised three pre-COP20 events on sustainable cities and we managed 47 international presentations within the Environmental Fair. This laid the foundations for a project on Sustainable Cities with a small grant so that the project and cooperation can continue.

I have also contributed to several policies. First of all, I contributed to the formulation of the 2009 Peruvian Environmental National Policy on the chapter concerning Conservation and sustainable use of natural resources and biodiversity,

“

**Nowadays, I am
part of the team
in charge of the
National Adaptation
Process for Peru on
climate change.**

and the marine and coastal ecosystem policy chapter.

In 2016, I helped with the formulation of the Nationally Determined Contributions for the adaptation to climate change within the Peruvian fisheries and aquaculture sector. Nowadays, I am also part of the team in charge of the National Adaptation Process for Peru on climate change.

While passing on my knowledge at the Saint Ignatius of Loyola University in Lima, I taught my students a skill that I've learnt during the EcoMaMa Master course myself: to always have a critical mind, to never fully believe what someone else says and to go find the truth in books, documents, journals, ... or yourself.”