

Royal Society-FCDO Africa Capacity Building Initiative (ACBI)

Research laboratory capacity: case study

The ACBI programme at a glance

Strengthening research capacity in low-and-middle-income countries is recognised by international research funders and development agencies as a major contributor to a country's socioeconomic development and to achieving Sustainable Development Goals¹. The UK Government's Foreign, Commonwealth & Development Office (FCDO) and the Royal Society (RS) have funded the Africa Capacity Building Initiative (ACBI) which aims to "strengthen the research and training capacity of higher education institutions and support the development of individual scientists in sub-Saharan Africa through UK-Africa research collaborations"². ACBI funds ten research consortia; each consortium comprises one UK and three African institutions. Consortia research focuses on three areas — water and sanitation; renewable energy; and soil-related science.

The Centre for Capacity Research (CCR) at Liverpool School of Tropical Medicine, leading the monitoring, evaluation and learning component of the ACBI programme, explored factors influencing the capacity of research laboratories to support consortia projects during and beyond the lifetime of the programme.

This case study highlights some of the challenges hindering the advancement and sustainability of laboratory capacity in African research institutions and it showcases an inspiring story of a laboratory technician involved in the ACBI programme. His story demonstrates the importance of programmes such as ACBI, in strengthening the human resources and infrastructure of laboratories, which are often overlooked in research capacity strengthening programmes.

1. United Nations Educational Scientific and Cultural Organization (UNESCO). UNESCO Science Report: towards 2030 [Internet]; 2015 [cited 2017 May 15]. <https://unesdoc.unesco.org/ark:/48223/pf0000235406>

2. The Royal Society [Internet]. Royal Society-DFID Africa Capacity Building Initiative [cited 2017 Jul 12]. <https://royalsociety.org/grants-schemes-awards/grants/africa-capacity-building/>

Challenges

Laboratories are crucial for many types of research in Africa yet they are widely neglected within research programmes. Laboratory technicians across the ACBI consortia reported numerous challenges including:

- Neglect and lack of investment in laboratories by institutions with the majority of technicians feeling unrecognised and under-valued.
- Maintaining and procuring up-to-date advanced equipment mainly due to lack of budget and bureaucratic procurement systems.
- Limited opportunities for professional development and career progression for laboratory staff; particularly a lack of training on new technologies and techniques so they could provide better support to students and researchers; and very scarce scholarship opportunities and exchange visits to state-of-art laboratories in other institutions.
- Understaffed laboratories which creates stress for laboratory staff who often teach a large number of students and also help postgraduate research students conduct their experiments. Some laboratory technicians reported working unpaid additional hours including over weekends.
- Poor laboratory infrastructure ranging from inadequate physical space in the laboratory, to the leakages in the ceilings, power cuts, poor internet, lack of basic equipment (such as laptops – despite their importance for collecting and storing data) and lack of health, safety and quality assurance systems for laboratories.
- Hierarchical structures affecting constructive communication between laboratory technicians and decision makers (such as heads of the departments, lecturers, managers, researchers and postgraduate students) and exclusion of technicians from decision-making processes.

Opportunities: Benard's story

Benard Goga is a laboratory technologist at the chemistry department, Maseno University. One of Benard's main roles is assisting the undergraduate and postgraduate research students (including one of the ACBI PhD students) with their laboratory-based renewable energy-related research.

The principal investigators of Benard's consortium spotted an opportunity to train him in glassblowing and to equip his laboratory in Kenya with glassware bending and production. As a result, Benard spent three months learning glassblowing techniques in a specialised laboratory at the University of Nottingham. Benard is one of few technicians offered a transformative opportunity for an exchange visit to the UK through ACBI.

Benard expressed much gratitude for the training opportunity, describing the exchange visit as a "miracle" as he had previously had almost no opportunity for professional development. He was overwhelmed by the overall experience and recommended that such opportunities should be considered by other institutions across the ACBI consortia.

"When a scholarship or a sponsor come to our department, people usually think about students and lecturers. They don't think about technicians. So a technician can struggle to go to class with little money... Recognition of technicians is not there. We are being neglected...it's a challenge that we are facing... It's the first time in Maseno history when I was taken to Nottingham University to study glass blowing technology... I was assisting our student to my level best as technician in charge...then this opportunity came... I think the PIs discussed the best ways of – one: to empower, the capacity building was to empower a technician for the first time – to me it was a miracle and I was very much happy for sure...; second: we want to solve the problem of glasses in our university because some of the glasses we are using to do the practicals are very expensive and maybe if we want to bend the glass for an experiment to fit the kind of research we want, we do not have this kind of technology [at our labs] ... I was considered because I was working with a PhD student [ACBI-affiliated], and they were considering who can go do it and bring the technology home... so that we can establish glassblowing lab in our department..."

"To me, it was a miracle"

Benard Goga, laboratory technologist at Maseno University.



Left: Benard at an engagement event with the Royal Society in October 2019 in Lusaka, Zambia.

Right: The Royal Society-FCDO ACBI affiliated laboratory technicians at an engagement event with CCR/LSTM in October 2019 in Lusaka, Zambia.

How were data collected?

Findings presented in this case study were derived from qualitative data, collected by the CCR research team through semi-structured in-depth interviews and focus group discussions (FGDs) with eighteen laboratory staff who were associated with the ACBI programme.

Laboratory staff highlighted the challenges hindering laboratory capacity strengthening in public research institutions in Africa; benefits attained through ACBI; and suggestions for optimising long-term impact and for sustaining capacity gains.

Unanticipated learning

Besides gaining new technical skills in glassblowing, Benard highlighted some of the unanticipated learning and benefits he acquired during his exchange visit. These included best practices in health and safety, laboratory management, handling chemicals, networking, and establishing good relationships with other laboratory staff in the UK.

“In Nottingham before you go into any lab there is eye protective gadget you can wear goggles. ...in Nottingham it is the first thing you are meeting at the door. Gloves are everywhere. You can't be in the lab without lab coat.”

He deemed such training and experiences as highly valuable, not only for motivating individual laboratory technicians and for strengthening their capacity, but also for their own laboratories and institutions.

“...me going to Nottingham was the best thing which the DFID (FCDO) project had thought of... I really recommend this even if it is not only to the glassblowing technology. I recommend it because when you get exposed, you learn many things. Apart from the training I got in the lab, that was the first time I saw a standard lab with everything you require. In fact, by the time I was coming from Nottingham and going back to Maseno it took me some time to fit back into our system.”

Changes in laboratories' rules and regulations

Upon his return to Maseno, Benard shared his learning with the chairman of the chemistry department and suggested ways to improve laboratories' health and safety measures to protect against dangerous chemicals. Benard has witnessed serious laboratory accidents and is keen to make laboratories a “safe place”.

“Now from what I learned in Nottingham, I'm now tightening the rules to the student in my research lab, because I'm responsible for the lab...Now, before you bring me a letter, because usually, they write a letter so that I give them the space in the research lab, I insist, and we agreed, and there is a form being signed, that you'll not work in the lab without a lab coat, without wearing the eye-protective, because we have some which we had given the researchers. When I was in Nottingham it became part of me. I feel it SHOULD be done – not like before.”

Equitable relationships

Benard addressed the importance of equitable relationships between laboratory technicians, students and supervisors or principle investigators. He praised the dynamics of such relationships at the University of Nottingham where he was working.

“Everybody was respected. Everybody was doing the right thing. Technicians were motivated. They were working for students... They are freely willing to help. Students also respected them. ...when I went to Nottingham, I found my chair, where I was going to work, ready waiting for me. They put everything in place. I had my working corner, I had my glasses, I had my lab coat. Everything was ready and the communication was, if it is not 100% it's 99%.”

Benard admired acts of kindness and appreciation that occurred between those in higher position such as a senior researcher and laboratory technicians giving the example of a professor who praised the hard work of laboratory technicians and encouraged them to strive for career progression. “To me, I think that's the best thing if we can do to technicians, it can motivate them. To me, that alone is enough to motivate me.”

Bringing the learning and technology home

Upon his return, Benard submitted a report about his visit and suggested recommendations for the new glassblowing laboratory. The University of Maseno had already identified a laboratory and is currently in the process of refurbishing it for the glassblowing work. The University of Nottingham donated a full kit of glass blowing equipment and enabled shipping to Maseno.

“As we are talking today, we have the glasses, and we have the burner. The only challenge which we are still having is the preparation for the laboratory for the glass blowing because with glass blowing you cannot do it in any lab. You need to build a chimney for removing the mono-nitrogen oxides outside of the lab because when you inhale them, they become poisonous to you...so as we are talking we are at the process of doing that, but soon we will start a glass blowing laboratory in Maseno...there is a process going on. I have the tool, I have the glasses, we are just waiting for the completion of the renovation of our lab. There is lab which was identified by the university. The only challenge which we have is that the public university process is slow...”

The lead researcher at Maseno University has provided assurances that the set-up of the laboratory will be prioritised once they emerge from COVID-19 disruptions.

Lessons learned and way forward

Research laboratories play a vital role in generating and fostering research in sub-Saharan Africa. Strengthening laboratories' capacities in low- and middle-income countries is a continuous process which requires active involvement of many key players involved in institutional research support systems, and nationally and internationally through collaborations and securing funds to support the advancement of laboratories' capacity.

Sustainable capacity of research laboratories depends on: well-equipped facilities, trained laboratory staff and reliable funds to ensure timely repair and regular maintenance of the equipment. It is critical for research institutions to a) acknowledge and value laboratories' role in research and b) to endorse an institutional strategy and action plan which ensures financial sustainability and long-term support and maintenance for laboratories' facilities and infrastructure, including their staff. This requires good leadership, commitment and structural reforms at the institutional level.

Some key lessons learned from the ACBI programme about how it contributed to an enhanced laboratory capacity include:

- **The purchase of advanced equipment and research instrumentation**

This proved to be a major catalyst for conducting quality research work which otherwise could not have been possible. Such equipment included laboratory and field equipment, laptops, GPS, projectors, computational software, advanced computers and consumables. In most cases the benefit and usage of such equipment is not merely limited to ACBI-affiliated PhD students but extended to other researchers and research support staff (including laboratory staff) and students in the department/local institution.

- **Engaging laboratory staff in negotiating procurement processes**

The ACBI programme provided some laboratory technicians with the opportunity to engage in procurement processes including being consulted about the specifications of the equipment and the quality of the consumables/chemicals.

- **Acknowledging and valuing laboratory staff and supporting their professional development and career advancement**

Specialised and well-trained laboratory staff are essential for running complex or technologically advanced equipment and for ensuring reliable results. Embedding training opportunities for laboratory staff in future programmes is vital. These include the provision of scholarship opportunities and vocational training; arranging exchange visits to state-of-art laboratories in other institutions; actively involving them in research projects; and facilitating their participation in regional and international conferences and workshops to give them opportunities to increase their network and partnerships with their peers and fellow colleagues. All ACBI-affiliated laboratory technicians who had the chance to take part in consortia-led training, including exchange visits in Africa or the UK, stated that they benefited substantially from that experience. They were keen that all research programmes should mimic this model and seriously consider investing more in laboratory staff from the onset of the programme.

- **Pro-active planning for sustainability of research laboratories by institutions and funders**

is important to consider in future research capacity strengthening programmes. This includes strategies for maintenance and enhancement of laboratory functionality beyond the lifetime of the project; developing cost-recovery strategies for the laboratory such as commercialization of laboratory services and introducing bench fees for research students; establishing co-funding agreements between institutions and external partners/funders; planning and allocating budget for laboratory accreditation; and investing in institutional structural reforms to improve laboratories' effectiveness.