Stronger research through combined expertise: multi-disciplinary partnerships in the ACBI programme

Complex development challenges require a combination of expertise from different areas, as no single discipline can provide a complete solution.

The Africa Capacity Building Initiative (ACBI) projects, funded by the Royal Society and the Foreign, Commonwealth and Development Office, were no exception to this rule. Tackling some of the most long-standing and difficult issues faced by countries in sub-Saharan Africa, such as access to nutritious food, clean water and safe sanitation, the projects brought together geologists, engineers, soil scientists, nutritionists, health experts and statisticians, to name but a few.

Professor Richard Taylor, from University College London, was the UK lead investigator in the AfriWatSan consortium which looked at urban water supply and sanitation systems. The research, involving the University of Nairobi in Kenya, Université Cheikh Anta Diop (UCAD) in Senegal and Makerere University in Uganda studied three sites of different size and characteristics: the town of Lukaya in Uganda, the city of Kisumu in Kenya and the mega-city of Dakar in Senegal. The research involved hydrogeologists to study how water moves through the subsurface and any contamination that occurs, engineers looking at the sanitation infrastructure, such as pit latrines and septic tanks and how it is managed, and public health experts to assess the impact on these communities.

Without controlled trials or long-term epidemiological studies, it is a challenge to link the condition of infrastructure, water quality and water quantity to human health outcomes. But the mix of expertise enabled the consortium to make general associations between the health impacts they observed and the state of the water and sanitation infrastructure.

Professor Taylor said: “Each of the partners contributed expertise across all of these areas, supervising truly multidisciplinary PhD projects with a strong willingness to collaborate. As well as breaking down barriers between the different disciplines, the project also broke down barriers of hierarchy, by training and empowering technicians within the institutions as well as students and academic staff. This saw technicians developing and coordinating protocols for sampling and analysis that were implemented across the different institutions.”

The project found that in all three sites, water supplies designated as safe under UN guidelines were in fact contaminated by faecal matter. Water sources were also often contaminated for a short period after heavy rain, highlighting the need for more resilient sanitation and better systems to warn communities of the risk. The research piloted a new technique for monitoring water supply using fluorescence, proving it was more effective than standard sampling.

The work has already generated interest from other research partners, such as the French National Research Institute for Sustainable Development (IRD). The IRD has been looking at sanitation and water supplies in Cotonou, Benin and is now working with the ACBI team in Dakar, Senegal, bringing it into a wider project involving partners in Morocco and Tunisia. The multi-disciplinary nature of the PhD projects also attracted the interest of the International Atomic Energy Agency, which is now looking to support similar PhD projects with the ACBI African partners.

Image: Members of the AfriWatSan consortium.

Professor Taylor said: “In each of the countries involved in the project, the multi-disciplinary nature of the research has been really appreciated as key to tackling strategic questions. This has led to invitations to speak to government panels, presentations at the UN SDG conference and the World Water Forum. It’s been very satisfying to see how the project has strengthened the expertise and raised the profile of all the researchers involved.”

Professor Martin Broadley and Professor Patson Nalivata were two of the lead investigators on another multi-disciplinary ACBI project investigating how soil management impacts not only agricultural yields, but also the quality of crops in terms of the nutrients and micronutrients they contain or the soil contaminants they absorb. The project involved soil scientists and geochemists for soil analysis, geostatisticians to map different processes and soil types across wider areas, and experts in agricultural management. Each of the partners brought different expertise to the consortium: the University of Zimbabwe, the Zambia Agriculture Research Institute with the University of Zambia, and Lilongwe University of Agriculture and Natural Resources (LUANAR) in Malawi are all specialised in agriculture and soil science. The UK partners, the University of Nottingham and the British Geological Survey, brought expertise in geostatistics and techniques and facilities to carry out detailed soil chemistry.

The team has since been successful in securing approximately £13 million for five new related projects, which Professor Broadley, now at Rothamsted Institute, believes would not have been possible without the ACBI funding.

He said: “By its nature, agriculture research involves multiple disciplines, so all partners were well-versed in working that way. The ACBI project was different to many in that it was structured to ensure benefits accrued to the African institutions. This helped to build trust and solidify the partnerships, building a strong team. This is what enabled us to move forward confidently to build wider partnerships and win the new funding.”

For Professor Nalivata, lead investigator at LUANAR in Malawi, the capacity building aspects of ACBI have been central to supporting the development of new multi-disciplinary partnerships. The University was able to purchase a microwave plasma atomic emission spectrometer (MPAES), which gave them the capacity to carry out more complex analysis of soil and plant samples. The new research built on the ACBI project has also seen Professor Nalivata collaborate more closely with colleagues from other faculties within LUANAR.

Image: Dr Max Lowole (LUANAR) giving a lesson on soil taxonomy to the *Strengthening African capacity in soil geochemistry* consortium, September 2016 at Chitala (Salima District), Malawi.

"The MPAES has revolutionised the way our laboratory can operate," said Professor Nalivata. "It has enabled us to build a stronger relationship with research colleagues within the University and from the Department of Agricultural Research and Services (DARS) in Malawi, to ensure the instrument is being used for the benefit of the country as a whole. We're now carrying out research at all levels, feeding into wider government efforts and policy initiatives."

The multi-disciplinary PhD students supported through the ACBI funding were also key to building capacity for wider partnerships, says Professor Nalivata.

"The ACBI touched on something that is rarely done in grant funding – building the capacity of universities to train PhD students across multiple disciplines. This helped not only to strengthen our research base but also the overall robustness of the University to take this kind of multi-disciplinary programme forward.

We need more PhD students in Africa and this kind of support is vital to bring us to the level of other countries around the world."

Image: The microwave plasma atomic emission spectrometer (MPAES) being installed at LUANAR, Malawi, purchased by the *Strengthening African capacity in soil geochemistry* consortium with ACBI funds.

The Royal Society-FCDO Africa Capacity Building Initiative (ACBI) is a pilot programme funded by the UK Government's Foreign, Commonwealth and Development Office in collaboration with the Royal Society to increase the research capacity of universities and research institutes in sub-Saharan Africa.

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