

EVALUATION OF THE BILATERAL RESEARCH COOPERATION BETWEEN SWEDEN AND UGANDA

EVALUATION REPORT



KNOWLEDGE CONSULTING LIMITED

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Table of Contents

Abbreviations.....	4
Executive Summary.....	5
1. Introduction.....	13
1.1 Background.....	13
1.2 Evaluation Framework and Methodology.....	13
1.2.1 Evaluation Framework.....	13
1.2.2 Methodology.....	14
1.3 Report Outline.....	15
2. Setting the Context.....	16
2.1 The East African Research Environment – Evolution, Challenges, and Opportunities.....	16
2.2 A Comparative Overview of Research within Eastern Africa.....	19
3. Evaluation Findings.....	22
3.1 Findings based on the OECD/DAC Evaluation Framework.....	22
3.1.1 Relevance.....	22
3.1.2 Coherence.....	23
3.1.3 Effectiveness.....	25
3.1.4 Efficiency.....	27
3.1.5 Impact.....	30
3.1.6 Sustainability.....	34
3.1.7 Unintended Outcomes.....	37
3.1.8 General Findings.....	37
3.2 Findings Based on Site Visits.....	38
3.2.1 CEDAT.....	39
3.2.2 CHS.....	39
3.2.3 COVAB.....	39
3.2.4 CONAS.....	40
3.2.5 DICTS.....	40
3.2.6 Main Library.....	40
3.2.7 Key Findings.....	40
4. Taught PhD Programme in Mathematics.....	42
4.1 Findings from the Student Survey.....	42
4.1.1 Overview.....	42
4.1.2 Impact of the Programme.....	43
4.1.3 Enhancing the Programme.....	44

4.2 Findings from Faculty.....	45
4.2.1 Impact/Sustainability.....	46
4.2.2 Enhancing the Programme.....	47
5. Summary of Findings, Recommendations, and Conclusions.....	48
5.1 Findings based on the OECD/DAC Framework.....	48
5.1.1 Relevance.....	48
5.1.2 Coherence.....	48
5.1.3 Effectiveness.....	49
5.1.4 Efficiency.....	49
5.1.5 Impact.....	50
5.1.6 Sustainability.....	51
5.1.7 Unintended Outcomes.....	52
5.2 Key Findings Based on Site Visits.....	52
5.3 Key Findings Related to the Taught PhD in Mathematics.....	53
5.4 Findings Regarding Key Questions.....	54
5.4.1 Current Planning for the Sustainability of Research Training at Mak and Other Supported Universities in Uganda.....	54
5.4.2 Achievement of Better Outcomes.....	54
5.4.3 Impact on the Local PhD Programmes.....	55
5.4.4 Supervision Quality, Commitment, and Completion Time.....	55
5.4.5 Improved Research Capacity at the Collaborating Ugandan Universities.....	55
5.4.6 Sustainability of the Research Environment and Research Training.....	56
5.5 Overall Recommendations (regarding Sida’s general approach to research capacity building).....	56
5.6 Conclusions.....	57
Appendix A: Research Questions.....	58

Abbreviations

Term	Description
AfDB	African Development Bank
CEDAT	College of Engineering, Design, Art and Technology
CHS	College of Health Sciences
CONAS	College of Natural Sciences
COVAB	College of Veterinary Medicine, Animal Resources and Bio-security
CREEC	Centre for Research in Energy and Energy Conservation
CV	Curriculum vitae
DAC	Development Assistance Committee
DICTS	Directorate for ICT Support
DSS	Demographic Surveillance Site
ICT	Information and Communications Technology
ISP	International science programme
KCL	Knowledge Consulting Ltd
Mak	Makerere University
MUCHAP	Makerere University Centre for Health and Population Research
NORAD	Norwegian Agency for Development Corporation
NREN	National Research and Education Network
RCP	Research Collaboration Programme
Sida	Swedish International Development Cooperation Agency
SOW	Scope of work
SPIDER	Swedish Programme for ICT in Developing Regions
OECD	Organisation for Economic Co-operation and Development
TOR	Terms of reference
UNBS	Uganda National Bureau of Standards
URAFR	University Research, Academic, Administrative and Financial Reforms

Executive Summary

The Swedish International Development Cooperation Agency (Sida) has been providing support to universities in Uganda to strengthen research capacity and research training that are also relevant to poverty reduction and sustainable development. Starting with Makerere University (Mak) in 2000, the programme has grown to encompass a network involving five universities in Uganda and 17 universities/institutions and agencies in Sweden. This report presents the findings and recommendations from a desk-evaluation that drew on four previous evaluations.

Responses to the Key Questions

i. Current Planning for the Sustainability of Research Training at Mak and Other Supported Universities in Uganda

Mak now has in place the qualified human resources as well as the policies and procedures, systems and institutional arrangements required to plan for and sustain a strong research and research training environment – and continuing review has been incorporated into these. The weak area noted in the evaluation is the continuing failure to plan for and allocate sufficient funding to research.

In addition to having new PhDs, the final phase of the research collaboration programme (RCP) does show some evidence that the collaboration started in PhD training, policy development and research, but based on some of the conversations with public partner universities (PPUs), much still needs to be done to really strengthen the collaboration.

ii. Extent to Which Regional and International Research Team Collaborations Have Been Established

Regional and international research team collaborations have been established as evidenced by multiple sources of funding both for equipment and research along with collaborations. These include the East African Universities Mathematics Programme (EAUMP), which is supported by the International Science Programme (ISP) under the University of Uppsala and which played a major role in the starting of the PhD programme in mathematics; and the Centre of Excellence for Sustainable Health (CESH) between Makerere and Karolinska.

iii. Achievement of Better Outcomes

Considering the research context in Mak, in Uganda and in the region at the time the RCP started, it is difficult to conceive a more efficient way in which better outcomes could have been achieved. The only aspect that could have been added would have been using the RCP to leverage improvements in the national research environment so that more funding for research from the government would be made available.

iv. Impact on the Local PhD Programmes

The quality of the local PhD programmes was not directly evaluated, but it can be stated through inference that their quality has improved significantly. This is based on improvements in the internal support environment, the quality of supervision, internal quality management, and the high ranking in high-impact publications, as discussed in this report. While the PhD programme in mathematics is still in its early years, discussions with staff involved in the programme indicate that the approach and methodology will feed into other PhD programmes at Mak. This programme has also generated a great deal of publications.

v. Supervision Quality, Commitment, and Completion Time

Based on the volume and quality of publications, the shorter completion terms and the increasing number of PhD graduates – totalling 327 since the RCP started – it can be inferred that supervision quality and commitment have improved. Other than the clear current move to shorten the duration of the taught PhD programme in mathematics noted during the current evaluation, the earlier evaluations do not indicate whether policies, procedures and standards were reviewed to recognise the positive changes and therefore institutionalise whatever led to them. This is an area that the Directorate of Research and Graduate Training (DRGT) and the Quality Assurance Directorate (QAD) are focusing on during the cycle of review of policies, procedures and standards, which is an ongoing activity. One of the web tools developed by QAD, for example, supports the monitoring of the durations of the different stages and activities of the graduate training process.

vi. Improved Research Capacity at the Collaborating Ugandan Universities

Out of 382 beneficiaries, PUs benefited from support to 79 PhDs, 124 Masters, 9 Post docs, 3 small grants and improved lab equipment during the final phase of the program. In addition, the PUs had more beneficiaries for the PhD in mathematics. This provides evidence of improved research capacity at the PUs as a result of the collaboration.

Other areas where the research capacity at PUs has benefited from the collaboration even though they were not part of the RCP objectives, included support from Mak for supervision training, research policy development and the development of gender

policies. Gulu University has now developed a Centre for Venom Production, which was equipped with Sida funding; and the Makerere Innovation Fund is open for collaboration among PPU in Uganda.

vii. Sustainability of the Research Environment and Research Training

Even though there are some challenges around sustaining the outcomes, as noted in various places in this report, the overall sense from all the evaluations, the strengthening of DRGT, the increasing allocation of internal and government funding for research and the attraction of new research funding all point to a high likelihood of sustaining the research environment and research training at Mak. The local PhD programmes established will be major contributors to sustainability as will be the now-high rankings associated with publications. It, however, still needs to be noted that the sufficiency of funding from internal, government and other sources remains one of the highest risks with respect to sustaining the outcomes.

Unfortunately, the insufficiency or absence of funding for the planned maintenance, repair or replacement of equipment (ICT (information and communications technology) and labs) remains a major gap. The accumulation of non-functional and often obsolete equipment points to the inability to dispose of them because (as indicated by one of the staff members) university policies have made the disposal of old and non-functioning equipment difficult.

The Taught PhD in Mathematics

All beneficiaries confirmed that the programme's design and objectives responded to their needs and priorities as PhD students. They had varying levels of satisfaction with different components of the programme, indicating most satisfaction with the supervision, followed by the quality of research training.

While most faculty members and students were optimistic that students would complete their PhDs within the planned timelines, this is unlikely to be the case. Two students and one faculty member did complain during the interviews about the long wait between the submission of the final dissertation and the holding of the formal defence, highlighting a key quality-related aspect that needs to be addressed.

Students and faculty were proud and appreciative of the research and collaboration networks built through the programme, and all planned to continue leveraging their networks for research. Most PhD students also planned to supervise students at both the PhD and M.Sc. levels at their universities. Such activities will have a multiplier effect in terms of impact, which is likely to last beyond the end of the programme.

The taught PhD programme in mathematics has been successful and appears to be set to change the format of PhD training at Mak and other public universities. The gap that

this programme was not structured to significantly inform and transform the research and research training environment in the other public university, however, needs to be recognised and addressed: this could indeed open the way for a new collaboration with Sida specifically targeting such universities, with Mak as a resource.

Key Findings Based on the Organisation for Economic Co-operation and Development (OECD)/DAC Evaluation Framework

The findings based on the OECD/DAC Evaluation Framework fed into the responses to the key questions mentioned above as well as the overall recommendations and conclusions.

i. Relevance

Four different evaluations from 2010 and 2018 affirm that the programme was responsive to the needs and priorities of Mak, with oversight responsibility being vested in the Mak Steering Committee. The common finding among all the evaluations from 2010 to 2018 was that the programme was consistent with national priorities regarding poverty, gender equity, and development.

ii. Coherence

It is evident that in addition to being the largest funder during the life of the programme, there was alignment of intent and interventions across multiple development partners who responded to both the national and Mak's needs. One of the evaluations (2014), while recognising coherence in terms of directing support to the same needs, did however express some reservations about the absence of programme-level coordination across the development partners as even Sida conducted a level of consultation with all.

iii. Effectiveness

A longitudinal examination of the various evaluations reveals increasing improvement of the processes related to research over the last 18 years to the current status such that they can be considered entrenched albeit subject to continuing review and improvement. Similar to administrative processes related to research, there has also been significant improvement in the processes related to PhD training. The findings of the different evaluations have also been consistent in affirming that the programme achieved its design objectives. Especially lauded was Sida's approach, which distinguished itself by placing emphasis on capacity, including addressing the research environment.

It is very likely that a key factor in increasing Mak's international visibility and ranking is the increased number of research publications, something to which Sida, as the main

funder for research capacity building and research, is a major contributor. The establishment of policies, procedures and standards to guide research and research management and institutional arrangements such as DRGT and QAD should be able to ensure continuing improvement.

iv. Efficiency

The least cost question is almost impossible to respond to conclusively as it relates to a complex intervention that was not just about providing funding for research but also for supporting the transformation of the entire research environment. It is therefore not surprising that while all the evaluations touched on different aspects of how costs could be reduced, there was no answer then, nor is there one now, to this question.

The programme objectives were not achieved within the planned timelines, ascribed largely to the under-utilisation of funds due to weak management and implementation processes. While the programme administrative systems have improved over time, the 2018 evaluation still found that *'Financial resource absorption is still a challenge as most of the projects have less than 50% budget utilization'*. There has been a positive development in that current performance based on the most recent audit reflects an improvement in absorption for the year ending 30 June 2021.

Whether better outcomes could have been achieved from the research cooperation through using the same resources differently, such as the least cost question discussed above, is a question that cannot be answered when it comes to such a complex programme of change unless this was planned to be measured against alternative existing models designed to achieve the same end. The earlier evaluations point to areas where increased cost-efficiencies could have been achieved, but it is difficult to link cost-efficiencies to better outcomes.

v. Impact

The evidence presented in evaluations across the years points to improved academic quality within local PhD programmes as a major area of success. The RCP triggered and supported a comprehensive overhaul of the institutional arrangements and processes related to research and all graduate training, leading to a more efficient and effective support environment. Key areas of the RCP that made major contributions to and impacted research activity at Mak, and therefore to the achievement of the RCP's objectives, included the participation of Swedish universities and collaborators, the sandwich programme approach to PhD training, cross-cutting courses and institutional support to improve the research environment.

vi. Sustainability

The strong institutions, policies and processes supported by ICT enabled systems are key to sustaining a strong research-support environment, and this was achieved under the RCP. Increased international visibility is also attracting new research funding to Mak. Right from the start, Mak budgeted for sustainability, but this later collapsed, leading to particularly the neglect of preventive maintenance and replacement of equipment where infrastructure interventions had been funded.

Interviews confirmed growing teamwork among researchers, increasingly viable local research groups able to incorporate master's-level students, and external research and collaboration networks that would likely last beyond the programme. Beneficiaries of the PhD programme in mathematics also mentioned improved visibility among their peers and within their discipline, more networking opportunities and a new-found position as a source of inspiration for other young researchers.

Even though there are some challenges around sustaining the outcomes, the overall sense from all the evaluations, the strengthening of DRGT, the increasing allocation of internal and government funding for research and the attraction of new research funding all point to a high likelihood of sustaining the outcomes of the RCP. It, however, still needs to be noted that the sufficiency of funding from internal, government and other sources remains one of the highest risks with respect to sustaining the outcomes.

All the evaluations confirm that Mak's research is now relevant to Uganda's national development needs, albeit with concern about the utilisation of the research output to that end. Until there is a demonstrable and impactful uptake of research output in ways that impact national development, increased funding from government will remain tenuous.

The key finding that emerged from the site visits to labs is the insufficiency or absence of funding for planned maintenance, repairs or replacement required by obsolescence. The accumulation of non-functional and often obsolete equipment points to the inability to dispose of them because (as indicated by one of the staff members) university policies have made the disposal of old and non-functioning equipment difficult.

vii. Unintended Outcomes

Based on interviews with programme participants, there were several positive unintended outcomes, including improved quality assurance as a result of joint degrees and positive impacts on the research agenda at the faculty level. Academic staff were additionally said to be increasingly sought after by the government as experts and resource persons.

While the focus on sciences aligned with national development priorities, an unintended negative consequence is that the humanities-based faculties have been left behind in terms of research output. It is true that science is critical for development. It nevertheless needs to be emphasised that the sciences and humanities must come together to achieve holistic national development.

Overall Recommendations (regarding Sida's general approach to research capacity building)

Change management is an aspect that needs to be emphasised as part of programme design because many of the challenges related to environment and efficiency have behavioural origins. This ranges from the leeway postgraduate faculty take for granted in working according to their own instead of the institutional timetables; bureaucratic cultures that slow down systems, however efficiently designed; and taking maintenance as a peripheral consideration in allocating resources.

Any future programme of this kind of magnitude, or even smaller, should place considerable emphasis on achieving impact at the national level; until this happens, failure to sustain outcomes will always be a major risk. Sustainable change at the institutional levels can only be achieved within the context of changes at the national level, and it is recommended that programmes in Uganda or elsewhere incorporate this as a key element.

National ownership funding could be achieved by using Sida funding to leverage improvements in the national research environment so that more funding for research from the government is made available. This could incorporate an approach to funding predicated on counterpart funding from the government right from the start (cash rather than the in-kind approach that was used). Such an approach could be structured with Sida funding starting low during the early phases, where there is major focus on institutional support, then scaling up with the major focus on research and research capacity building and then scaling down as national government funding takes up the load on an increasing basis.

It is true that the national capacity in science is critical to development, but it should also be recognised that the humanities, which more often than not create the context of the development environment, are also an important area to support. Any future programme of this kind of magnitude, or even smaller, should place considerable emphasis on achieving impact at the national level; until this happens, failure to sustain outcomes will always be a major risk.

A planned cultural learning phase is always critical for any collaboration between countries with different institutional cultures or levels of development. Initially, there

was insufficient attention given to the need for cultural alignment, but the necessity of this was later better appreciated with supervisors from Uganda and Sweden visiting the universities of their counterparts and getting a better understanding of culture, strengths and limitations.

It would help a great deal, while also building up Mak's collaborative capacity, if Mak were to approach this collaboration with PPU's in the same way Sida approached collaboration with Mak. Should any future support be considered for the PPU's, it should be structured along the lines of strengthening their research capacity with Mak as a key player. This would also demonstrate a cascade effect in research capacity building.

Conclusion

The overall finding is that the RCP was an ambitious programme that was able to learn from and adapt to the Mak environment in a way that enabled the achievement of the planned outcomes. It is also evident that the research environment has developed to a level where the internal sustainability of outcomes can be achieved. The greatest risk factor remains the low levels of local funding from the government and the university.

1. Introduction

1.1 Background

The Embassy of Sweden in Kampala initiated this evaluation activity to understand the achievements of Sida's 20-year RCP with Mak as the principal contact and beneficiary institution. Besides exploring the accomplishments and lessons of Mak's transition from a teaching to a research-led university, the evaluation is also expected to yield general lessons of value for Swedish research cooperation in other contexts.

Sida has been providing support to universities in Uganda to 'strengthen research capacity and research training that are also to poverty reduction and sustainable development'. Starting with Mak in 2000, the programme has grown to encompass a network involving five universities in Uganda and 17 universities/institutions and agencies in Sweden. Mak has been the primary beneficiary. The programme has provided support over five consecutive agreement periods¹ and by the end of the RCP consisted of 17 projects spread across teaching and service units.

1.2 Evaluation Framework and Methodology

1.2.1 Evaluation Framework

The evaluation team drew on the OECD/Development Assistance Committee (DAC) evaluation framework (see Figure 1)² to assess the relevance, coherence, effectiveness, efficiency, impact and sustainability of the programme, as follows:

- i. **Relevance:** The extent to which the programme objectives and design responded to beneficiaries' (university and country) needs, policies, and priorities
- ii. **Coherence:** The compatibility of the programme with other interventions at Mak or other universities (internal within the university and external relative to their actors' interventions)
- iii. **Effectiveness:** The extent to which the programme achieved its objectives and results
- iv. **Efficiency:** The extent to which the programme delivered results in an economic and timely manner

1 Pilot Phase (Sept 2000–Dec 2001), 15 million SEK; Phase I (2002–June 2005), 104.110 million SEK; Phase II (2005–2009), 181 million SEK; Phase III (2010–2015), 215 million SEK; and the current and final phase, Phase IV (Nov 2015–June 2022), 320 million SEK.

2 OECD/DAC Revised Evaluation Criteria Definitions and Principles for Use. [Online]. Available at: <https://www.oecd.org/dac/evaluation/revised-evaluation-criteria-dec-2019.pdf> (accessed: 10 June 2022)

- v. **Impact:** The extent to which the programme has generated significant positive/negative, intended/unintended, high-level effects
- vi. **Sustainability:** The extent to which the net benefits of the programme continue, or are likely to continue.

It should be noted that a thorough assessment of the actual impact and sustainability would need to occur once a significant amount of time (several years in this case) has elapsed after the intervention. However, it is possible to use the current findings to assess the likelihood of the impact and sustainability, which was the approach used in this report.

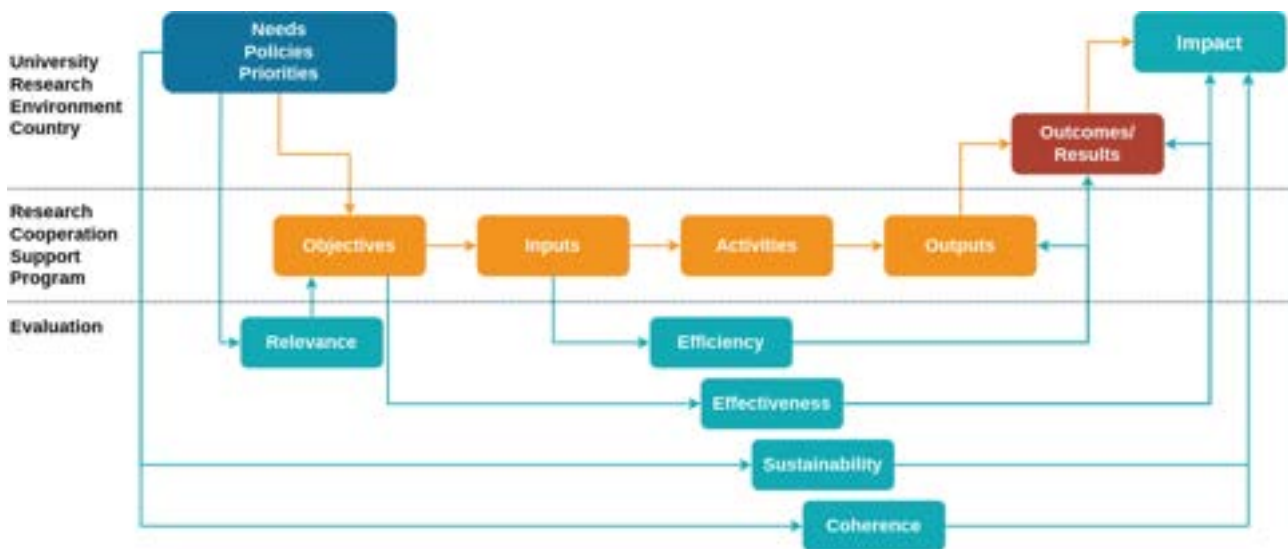


Figure 1: Overview of the OECD/DAC evaluation framework

1.2.2 Methodology

Drawing on the terms of reference (TOR), the methodology involved four major activities, which included the following:

- i. A desk study that drew on the earlier evaluation to respond to the key questions for this evaluation, including identifying any critical data gaps. This constituted the major core of the work.
- ii. A discussion of the findings with the DRGT as well as selected key informants to gain up-to-date information and new insights.
- iii. Online surveys conducted with PhD students and faculty of the taught PhD programme in mathematics.
- iv. Online interviews with programme staff and PhD faculty and site visits to research facilities established through or supported by the programme at Mak.
- v. An analysis, synthesis and compilation of the findings, conclusions and recommendations.

1.3 Report Outline

Following the Executive Summary and the Introduction in this chapter (Chapter 1), which also outlines the methodology used, Chapter 2 describes the context by providing a summary of the foundations, challenges and growth of scientific research within Eastern Africa, with a major focus on the countries that made up the original East African Community (EAC). The Chapter also provides a comparative overview, showing how Uganda performs currently based on various research indicators. This is followed by Chapter 3, which draws on previous evaluations since the RCP started as well as current insights drawn from site visits to the physical infrastructure. The evaluation included a required specific focus on the taught PhD in mathematics, the findings from which are given in Chapter 4. This is followed by responses to the key questions in the TOR along with a summary of recommendations in Chapter 5.

2. Setting the Context

Contextual considerations are always important when trying to create sustainable change. The evolution of research within Eastern Africa, with a particular focus on the original EAC, is briefly presented to provide the context for a comparative examination of progress within the region. This also provides the context within which the RCP was conceptualised and implemented.

2.1 The East African Research Environment – Evolution, Challenges, and Opportunities

There is furthermore no doubt that the scientists have quietly and perseveringly demonstrated a decisive aspect of the philosophy of the Community: their work on behalf of the eradication of hunger, poverty and disease is a potent argument in favour of continued cooperation between the East African states.³

This quote from an article published by Ann Beck in 1973 establishes the historical ethos of the scientific research targeting human development in Kenya, Tanzania and Uganda right from the latter colonial days and into independence. Much emphasis was placed on the collaborative regional research by the then East African High Commission starting in the late 1940s and later by the East African Common Services Organisation (EACSO) after 1961, which became the first EAC. This collaboration led to breakthroughs in areas such as the production of a vaccine by the East African Virus Research Organisation, which led to an almost complete eradication of outbreaks of rinderpest. Other research examples addressed sleeping sickness and bilharzia, with similar success. Under the EACSO and later the EAC, key scientific research agencies included the Medical Research Council, the Natural Resources Research Council and the Industrial Research Council. The Medical Research Council, for example, guided research through various institutes, including the Virus Research Institute, the Medical Research Centre, the Leprosy Research Centre, the Trypanosomiasis Research Organisation, the Institute for Malaria and the Tuberculosis Investigating Centre. Kenya, Uganda and Tanzania therefore became and continued as independent countries with a very strong foundation of development-focused research to the extent that even when the political disintegration of the EAC during the 1970s weakened funding, it did not stop formal collaboration.

Uganda's political instability starting from the mid- to late 1960s right into the early 1990s had

³ Beck, Ann (1973). 'The East African Community and regional research in science and medicine', *African Affairs*, 72(288), pp. 300-308. [Online]. Available at: <https://www.jstor.org/stable/719850> (accessed: 10 June 2022)

a severe impact on both research and research funding due to the negative synergy of the emigration of both local and foreign researchers, the elimination of opportunities for regional and international collaboration as all cross-border communication was politically suspect and a sharp reduction in funding for research. This was followed by the massification of education, a movement of opening up higher education opportunities to more students, which spread across Africa starting in the 1980s. Unfortunately, this was not matched by corresponding increases in funding, which negatively impacted both the quality of learning and research. For many universities, including Mak, fee-paying students became a critical source of funding, and the unplanned increases in admissions severely strained both human and infrastructure resources. The population of Mak, for example, 'was about 3,700 students in the 1970s, 4,700 students in the 1980s, 10,000 students in the 1990s ... more than 30,000 students in the 2010s'.⁴ With no funding for research outside a few isolated research grants, and an insufficient number of academic staff, who were therefore overloaded with teaching responsibilities, Mak became a teaching university. This is the backdrop against which Mak started its transformation process from a teaching to a research-led university,⁵ a process in which Sida (initially Sida/SAREC) has played a major, if not critical, role.

In the 2000s, development partners such as Sida, the World Bank, NORAD, ADB and others supported the increasing recognition of the role of science, technology and innovation in Uganda by supporting policy formulation and implementations geared towards research and development practices to build the human capital required for a knowledge-based economy.⁶ With the creation of research accreditation institutions such as the National Council for Science and Technology, the National Agricultural Research Organisation and the National Health Research Organisation, Uganda now has credible policies and solid institutional frameworks to support research in various disciplines.

The Uganda government formally embraced research and development as a priority in 2010 through the National Vision 2040, which is implemented through five-year development plans, the current one being the third (NDPIII 2020/21–2024/25). Objective 3 of the NDPIII addresses the Science, Technology and Innovation pillar which focuses on strengthening research and development capacities and applications by developing and implementing a National Science and Technology Innovation strategy and establishing research collaborations at the local, regional, and international levels. It also includes the establishment of a Research and Innovation Fund.

4 3,700 students in the 1970s, 4,700 students in the 1980s and 10, 000 students in the 1990s to more than 30,000 students in the 2010s

5 See also Ssebuwufu, J.P.M, 'Managing and transforming an African University'. [Online]. Available at: <https://carnegie.codesria.org/managing-and-transforming-an-african-university/> (accessed: 10 June 2022)

6 Brar, Sukhdeep; Farley, Sara E.; Hawkins, Robert; Wagner, Caroline S.. 2011. *Science, Technology, and Innovation in Uganda: Recommendations for Policy and Action*. A World Bank study. World Bank. <https://openknowledge.worldbank.org/handle/10986/2250> (accessed: 10 June 2022)

Higher education in Uganda faces a series of challenges, including a poor linkage between education, research and innovation and socio-economic development. In addition, the mounting cost of tertiary education coupled with dwindling funding from the government and the high proportion of students in the humanities and social sciences compared to science, technology, engineering and medicine remain major issues for tertiary education.⁷

Uganda is estimated to have about 2,200 PhDs but, based on higher education enrolment, requires more than 3,600 PhDs. The country currently produces about 100 PhDs a year, most of these at Mak, highlighting the need for large investments required to close the gap.

Mak accounts for more than half (65%) of all research undertaken in Uganda. Figure 2 shows that the bulk of research at Mak (47%) is in medicine, followed by agricultural and biological sciences (13%).⁸

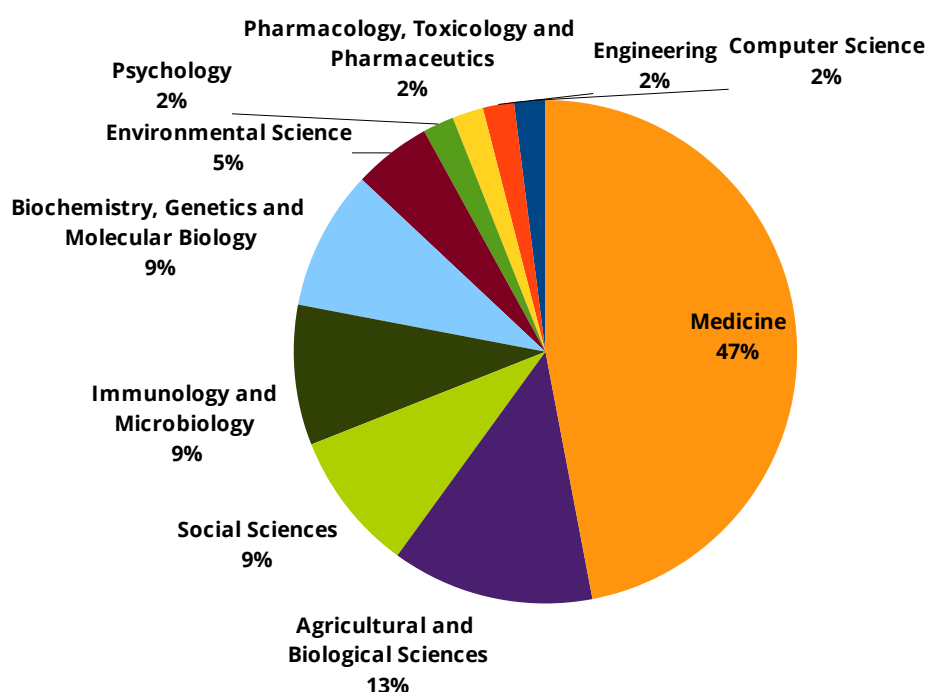


Figure 2: Share of the top 10 publications at Mak 2014 to 2019

Source: Dr Vincent A. Ssembatya (2022): *PhD Training as a Pillar in Uganda's Economic and Sustainable Development*.

7 African Union Commission, *Continental Education Strategy for Africa 2016-2025*, https://au.int/sites/default/files/documents/29958-doc-cesa_-_english-v9.pdf (accessed: 10 June 2022)

8 Ssembatya, Vincent A (2022). *PhD training as a pillar in Uganda's Economic and Sustainable Development*. Presentation Mak NORHED Week. [Online]. Available at: <https://news.mak.ac.ug/2022/04/phd-training-as-a-pillar-in-ugandas-economic-and-sustainable-development/> (accessed: 10 June 2022)

2.2 A Comparative Overview of Research within Eastern Africa

In July 2014, the African Union developed the 'Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024)'. STISA-2024 was designed to provide an enabling environment for science, technology and innovation to serve as an engine for development by meeting economic and societal challenges in the broader context of the AU Agenda 2063.⁹ Resulting from this strategy and others, the research output in East African countries has multiplied over the last decade, contributing to a solid scientific environment playing an increasingly important role in global science.¹⁰

STISA-2024 recommends a Gross Expenditure on Research and Development (GERD) of 0.5 to 1% of GDP. According to World Bank Indicators¹¹, GERD for Kenya, Rwanda, Tanzania and Uganda, respectively, was 0.8% (2020), 0.7% (2020), 0.5% (2018) and 0.2% (2020). Although GERD for Kenya, Rwanda and Tanzania has been increasing, Uganda's has been decreasing.

While seeking international funding is normal and expected of universities, the level of dependence among Eastern African countries is excessive: Uganda is the most dependent on such funding at 57.3%, followed by Kenya at 47.1%. Tanzania depends less on external funding, with the government providing 57.5%.¹² The Global Innovation Index (GII) 2021¹³ based on 2019 data ranks Uganda at 119 out of the 129 countries ranked by the World Intellectual Property Organisation (WIPO). Kenya, Rwanda and Tanzania are ranked 85, 102 and 90, respectively. It is evident that while the top political levels appear to give research and innovation major emphasis as national priorities, this does not feed through to a sufficiency of funding, creating a major sustainability challenge for the outcomes of external support such as Sida's. While there has been a positive step in the presidential pledge of UGX 500bn¹⁴ (about USD 140 million) for research and innovation every year, this, if realised, would be only 0.4% of current GDP, still below the AU recommended minimum.

Despite the low level of internal funding, Uganda's research is highly referenced and visible at the global level.¹⁵ Patra and Muchie (2021) indicated that, together, the 54 African countries

9 <https://www.merit.unu.edu/wp-content/uploads/2015/02/252608902-Innovation-for-Development-in-Southern-Eastern-Africa-Challenges-for-Promoting-ST-I-Policy.pdf> (accessed: 10 June 2022)

10 <http://info.clarivate.com/EACReportSocialDownload> (accessed: 10 June 2022)

11 https://tcdata360.worldbank.org/indicators/5b985527?country=BRA&indicator=40353&viz=line_chart&years=2013,2020#table-link (accessed: 10 June 2022)

12 <http://files.eric.ed.gov/fulltext/EJ1199141.pdf> (accessed: 10 June 2022)

13 https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf (accessed: 10 June 2022)

14 <https://mosti.go.ug/sites/default/files/publication/2021/04/National%20Research%20%26%20Innovations%20Program%20Framework.pdf> (accessed: 10 June 2022)

15 https://assets.publishing.service.gov.uk/media/5ef4adad86650c129b9af059/NA_report_Uganda_Dec_2019_Heart_.pdf (accessed: 10 June 2022)

published 1,158,398 research articles between 1990 and 2019. Eastern Africa accounted for 12.8% of all African publications, and Northern Africa dominated all regions, with 43.1%, followed by Southern African with 29.3% and West Africa (15.5%). Middle Africa accounted for the least number of publications, with 2.6%. At both the continental and regional levels, medicine accounted for the largest number of publications, with (29.3%), followed by agriculture and biological science with 15%.

Among the 18 countries of Eastern Africa, only Kenya (41,840), Ethiopia (28,440), Tanzania (20,675), Uganda (19,966), and Zimbabwe (13,230) had more than 10,000 publications each.¹⁶ While Uganda was ranked fourth in Eastern Africa in terms of number of publications (behind Kenya, Ethiopia and Tanzania), it was ranked second in citations (Kenya being top). Based on the number of patents in WIPO, Uganda was ranked seventh (behind Kenya, Ethiopia, Mauritius, Zimbabwe, Seychelles and Tanzania). The combination of a high ranking in number of citations and being low in patents points to a failure and therefore a gap in translating high-impact research to innovations.

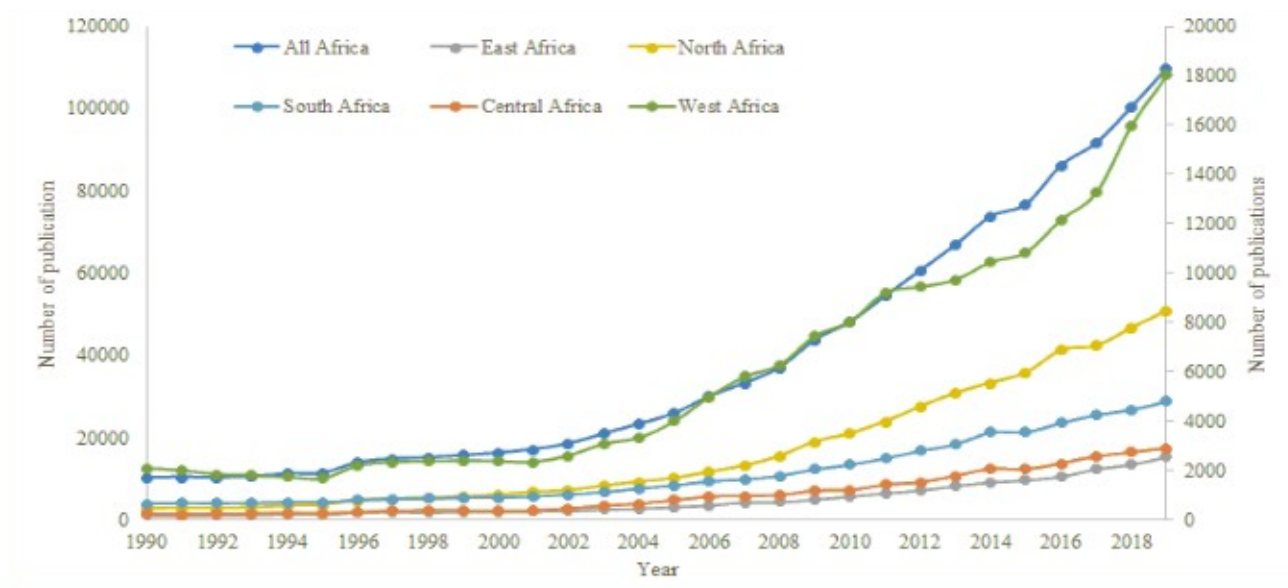


Figure 3: Trends in the number of African Publications from 1990 to 2019 by region

Source: Swapan Kumar Patra and Mammo Muchie, 2021

Table 1 shows the GII 2021 overall ranking by pillars of East African countries. Tanzania performs best in Creative Outputs (44) but is weak in Human Capital and Research (125); Kenya performs best in Market Sophistication (54) but is weak in Infrastructure (114); Uganda performs best in Institutions (89) but is weak in Human Capital and Research (131). Rwanda performs best in Institutions (54) but is weak in Creative Outputs (117).

16 Patra, S. K. and Muchie, M. (2021). 'Scientific and technical productivity of African countries: what Scopus and WIPO Patentscope data tell us', *Journal of Scientometric Research*, 10(3), pp. 355-365.

Table 1: GII 2021 Ranking Overall and by Pillar

Country	Overall GII	Institutions	Human Capital and Research	Infrastructure	Market Sophistication	Business Sophistication	Knowledge & Technology Outputs	Creative Outputs
Kenya	85	80	92	114	54	77	65	95
Rwanda	102	54	114	101	93	82	96	117
Tanzania	90	103	125	105	109	119	100	44
Uganda	119	89	131	103	111	118	105	126

Source: Global Innovation Index, <https://www.globalinnovationindex.org>

Connectivity is a major component of research infrastructure. The UbuntuNet Alliance has provided a regional and global connectivity vehicle for the national research and education networks of Kenya (Kenya Education Network Trust), Rwanda (Rwanda Education and Research Network), Tanzania (Tanzania Education and Research Network) and Uganda (Research and Education Network for Uganda) to interconnect universities in the region nationally, regionally and globally, enhancing opportunities for collaboration as well as access to other services at all those levels. Within Eastern Africa, Kenya is the most advanced with respect to connectivity, bandwidth, and services, followed by Uganda, Tanzania and Rwanda.

While Uganda is clearly capable of generating high-quality and high-impact research, it is evident that based on the comparative levels of progress within the region with respect to policy frameworks and funding, the country has a lot to learn from its neighbours. This also points to the need for research support from development partners to continually place emphasis on the transformation of the national environment so that the positive outcomes of programmes such as the RCP can be sustained through local enabling environments and funding.

3. Evaluation Findings

This chapter presents and discusses findings based on the OECD/DAC framework (through document review) as well as those from site visits, exploring opportunities for longitudinal comparatives and identifying and discussing any unplanned outcomes.

3.1 Findings based on the OECD/DAC Evaluation Framework

3.1.1 Relevance

Relevance was examined with respect to the extent to which the programme responded to

- Mak's needs and priorities in its transition from a teaching to a research-led university,
- Uganda's development needs and priorities and
- The individual research interests of students.

Four different evaluations from 2010 and 2018 affirm that the RCP, especially with oversight responsibility being vested in the Mak Steering Committee, was responsive to the needs and priorities of Mak. It should be particularly noted that the RCP has focused on the following three key dimensions of capacity:

- i. Strengthening the capacity of individual researchers as well as research groups;
- ii. Investments such as in ICT services and systems, libraries, geographic information systems (GIS), the Makerere University Centre for Health and Population Research (MUCHAP), and the equipping of laboratories; and
- iii. Addressing the institutional administrative and research environments to make them more effective, including reforms and organisational change. Quoting the 2018 evaluation, *'the programme was relevant and is in line with all strategic plans of the 5 public universities which were focused on strengthening teaching and learning, research and innovation, knowledge transfer & partnerships'*.

There was, however, some concern expressed during the 2014 evaluation that while the programme was overall responsive, funding was allocated only to research topics central to development. While this is a valid observation from the respondents, it needs to be recognised that the overall objective is national rather than institutional or specific to researcher interest, meaning that the support had to be responsive to national development priorities.

The common finding among all evaluations from 2010 to 2018 was that the programme was consistent with national priorities regarding poverty, gender equity, and development. There was also an evolution in terms of consistency with national priorities, starting from a 'basic alignment' (2010) to the alignment of university research policy with national development directions (2014): *'It also supports Ugandan overall development plans and the most recent research policy, emphasising the increasing role of research in the socio-economic development of the country'*. While it is not possible to argue attribution, it can be inferred that by insisting on funding only research aligned with national development objectives, the research collaboration contributed to the alignment of the Mak research policy and agenda with national development priorities.

The last evaluation, in 2018, was more specific about national level relevance: *'The programme was aligned to the government of Uganda's national development plan of transforming Uganda into a middle-income, knowledge-based economy based on the analysis of the national development frameworks. It also addressed the critical needs of the higher education sector in Uganda, as the country still has a greater need for PhD holders to support the rapidly expanding higher education sector'*. An overwhelming number of student beneficiaries (90%) indicated strong support for the collaboration approach, which they considered relevant to them.

3.1.2 Coherence

Coherence examined the extent to which the programme was compatible with ongoing interventions and support related to research (internal coherence) and consistent with international norms and standards related to university research and PhD training (external coherence).

The Sida-Mak Research Collaboration started at a time when national development needs, and indeed the very survival of Mak, depended on a complete shift from simply generating human resources for the public and private sectors to conducting research that was relevant to – and would therefore feed into – the national development agenda.¹⁷

It is evident that in addition to being the largest funder during the life of the

¹⁷ The authors of this report were key players in the transformation and have expressed this view based on experience. See also Tsubira, F. F., Mulira, K. N., Kahiigi, E. K., and Kivunike, N. F. (2008). *Transforming institutions through information and communication technology – the Makerere university experience*. Makerere University Directorate for ICT Support.

programme, there was alignment of intent and interventions across multiple development partners. Other development partners included the Norwegian Agency for Development Corporation (NORAD); the Dutch organisation for internationalisation in education (NUFFIC); private foundations such as the Carnegie Corporation of New York, the Rockefeller Foundation; and many others.

One of the evaluations (2014), while recognising coherence in terms of directing support to the same needs, expressed some reservations about the absence of programme-level coordination across the development partners. The areas of concern include the fact that Sida *'was managed as a distinct Swedish programme with its own account, Steering and Implementation Committees'* and that while the designation *'research programme'* was used, *'it was based on and linked to funding of discrete projects'*. This approach was considered not favourable to Mak, which faced the challenge of replicating the same approach for different funders, increasing management and administrative loads and costs. This particular evaluation, however, recognised that while *'there was no active coordination with other external donors, the Swedish Embassy maintained contacts and communicated with IDRC on administrative reforms, the Carnegie Corporation, the World Bank and Norway'*.

The RCP used a holistic approach to building research capacity, ranging from cross-cutting courses to mentorship, to supervision and supervisor training based on international research collaboration, to supporting and building up a culture of the dissemination of findings, to supporting the development of a strong research environment, including management and administration, quality management, policies and procedures, institutions and research infrastructure. Interventions extended into the key aspect of gender mainstreaming and ensuring the increased role and numbers of women in the top levels of research. A review during 2018 found that *'of the 323 programme beneficiaries 128 are females representing 40% of the beneficiaries. This is acceptable and above the target of 30%'*. Despite this positive finding, there is still a challenge in that¹⁸ *'inadequate support systems remain a key barrier to women's participation in research and consequently fast progression in the academic ranks and leadership'*.

The development of increased rigour to match international standards in the management of research was a key area of intervention. This led, for example, to the establishment of four research ethics committees (at the College of Health Sciences (CHS)), which are approved by the Uganda National Council of Science and Technology. *'Policies, tools and guidelines for improved research management and coordination were also developed'*. Administrative reforms supported by Sida *'triggered fundamental changes to Mak, including shortened examination periods, decentralized decision-making procedures, strengthened financial management, and improved academic delivery'*.

18 Statement from DRGT.

3.1.3 Effectiveness

Effectiveness examines the extent to which the programme supported Mak in improving processes related to research as well as PhD training. It also looks at the extent to which the programme achieved its design, increased research capacity and PhD training capacity at Mak, and improved the environment for research at Mak and PPUs.

A longitudinal examination of the various evaluations reveals increasing improvement of the processes related to research over the last 18 years to the current status such that they can be considered entrenched albeit subject to continuing review and improvement. This started with the documentation of basic processes during the first and second phases, the establishment of the Board of Research & Graduate Training as well as the DRGT during the third phase and documenting approximately 150 new or redesigned processes (Finance and Administration 90, Research 40 and Teaching and Learning 20) by the end of the fourth and final phase. It should be noted that these new and redesigned processes were developed through the University Research, Academic, Administrative and Financial Reforms (URAFR) Committee, which also received some funding support from Sida. The approach was holistic, which meant that both graduate and undergraduate programmes benefited.

Similar to administrative processes related to research, there has also been significant improvement in processes related to PhD training. The early years of the programme led to the establishment of manuals for the supervision of graduate students in some faculties. By 2014, it was found that *'Processes for following up PhD students are elaborate and ensure quality. Also, four research ethics committees were established at the College of Health Sciences and approved by Uganda's National Council of Science and Technology'*.

There was however a challenge noted with respect to *'the unclear terms of engagement'* for PPUs that, as discussed later in this report, could have had a negative effect on the potential benefit for such universities.

The findings of the different evaluations have been consistent in affirming that the programme achieved its design objectives. Based on the overall purpose of the programme, which was to 'build research capacity', the 2010 evaluation, for example, found that *'capacity development was substantial, and remarkable given the shortcomings in university administrative systems and structural problems'*. Especially lauded was Sida's approach, which distinguished itself by placing emphasis on capacity that also addressed the research environment. The 2014 evaluation highlighted significant (evaluated 5–9 on a scale of 0 to 10) increased or enhanced capacity with respect to carrying out quality and relevant research; the supervision of master's and doctoral studies, research productivity (publications and visibility), relevance to national development and the research environment (library and ICT). It should,

however, be noted that several areas were found to be wanting or weak (range 1–3), such as the capacity in PUs to conduct research, evidence-based policymaking in the areas of importance to national development, the generation and uptake of new innovations/technologies and research communication. Improvement in research management and coordination was also found to be weak (3–5).

The RCP was responsive through having the required flexibility to introduce new aspects of support over the first and successive phases. Some new institutions, such as the discussed URAFR Committee, could not have been anticipated. Support to areas such as ICT services and systems, which are driven by the evolution of technology, also required adaptive approaches over the duration of the programme. It must generally be accepted as a given that designing long-term support to an evolving environment always demands flexibility in approach.

There are mixed findings about the increase in research capacity, and the increased training capacity at Mak could be the result of different interpretations of what research capacity is. The 2010 evaluation, for example, reported that the number of PhD holders among the staff at Mak increased by 346% over the 10-year period from 1998/1999 to 2008/2009. The report, however, qualifies this by saying that *'The increase in PhD holders did not have the effect of increasing availability of senior academics contributing to academic program activities in the said period'*. Based on subjective assessment, the 2014 evaluation found that *'everyone involved'* in the programme felt it had *'highly contributed towards quality of research and doctoral degrees'* as a result of exposure to different academic environment. The number of staff pursuing PhD training during 2008 was said to be the same as ten years earlier: this was not qualified using typical duration, making a comparison of throughput, which is the real issue, impossible. *To this, the 2014 evaluation adds that 'Despite the large number of students in the programme, at the end of the programme...the number of graduates remained low'*.

It is evident that the research support environment, which was very weak at the start of the programme with respect to policies and procedures, systems and infrastructure, was very strong by the end of the collaboration programme. The establishment of policies, procedures and standards to guide research and research management, and institutional arrangements such as DRGT and QAD, should be able to ensure continued improvement. While there are still limitations in one-to-one end user access, Mak now also possesses state-of-the-art equipment with respect to the data network – funded during the fourth phase. Selected laboratories such as the GIS lab also have modern equipment.

There are, however, key limitations related to sustainability that Mak needs to address as a matter of priority if the research infrastructure provided under the programme is to remain beneficial. As one of the 2014 evaluations noted, *'Limitations still exist with respect*

to adequacy of laboratory equipment, malfunctioning software at the DSS¹⁹ and updating of software at the GIS laboratory'. The limitations to the management of research infrastructure were also evident from a walkabout through the labs and other facilities during March and April 2022, when it was noted that equipment was simply set aside if it broke down. This was either due to a lack of maintenance and repair capacity or lack of funding for planned maintenance and spares.

While previous evaluations cited lack of evidence that the research environments at PPU were strengthened as part of the collaboration, activities undertaken as part of the final phase point towards an improved research environment. It would appear that the greatest focus was on the taught PhD in mathematics – this has strengthened research capacity but not research-supporting infrastructure. The 2018 evaluation points out that *'...the main supervisors of local PhD students are supposed to be based at Mak as per the programme design even in areas where PPU had the capacity to provide the main supervisors for students. This was seen as an unfair practice as it largely benefits supervisors at Mak at the expense of the PPU's'*. The final phase of the RCP was, however, more effective with respect to supporting PPU:

- While institutional support to PPU was not part of the objectives of the programme, Mak, through QAD, did support supervision training and research policy development for them;
- Mak supported the development of gender policies;
- Where there was PhD training, the PPU also received equipment, which is an element of the funding for such training;
- Gulu university has now developed a Centre for Venom Production which was equipped with Sida funding; and
- The Makerere Innovation Fund is open for collaboration among PPU in Uganda.

The evaluations up to 2018 point to improvement in the communication and dissemination of research findings, but they are not definitive in this regard and indeed sometimes express reservations. The 2014 evaluation, for example, states that *'There is evidence of improved dissemination and communication of re-search findings, but this is an area, which is still too weak and unsystematic. Research proposals included dissemination plans and the researchers conduct dissemination workshops, but these were limited to the project sites'*.

3.1.4 Efficiency

Efficiency examines the extent to which the programme objectives were achieved and at least cost and within the planned timelines. It also examines whether better outcomes could have

¹⁹ The former Demographic Surveillance Site (DSS) was later re-named Makerere University Centre for Health and Population Research (MUCHAP).

been achieved from the research cooperation through the usage of the same resources differently. From a management perspective, there is an examination of how efficient the management and accountability structures of the programme were and how the programme's financial management processes and procedures affected implementation.

The least cost question is almost impossible to respond to conclusively as it relates to a complex intervention that was not just about providing funding for research but also for supporting the transformation of the entire research environment. It is therefore not surprising that while all the evaluations touched on different aspects of how costs could be reduced, there was no answer then, nor is there one now, to this question. The 2018 evaluation, which tried to analyse an aspect of this question, was challenged by absence of data, stating that *'The evaluation team did not measure value for money as documents for accountability could not be availed to the evaluation team members'*.

The programme objectives were not achieved within the planned timelines, ascribed largely to the under-utilisation of funds due to weak management and implementation processes. The 2010 evaluation specifically states that *'Initially there was no follow-up of performance and achievements compared to budgeted costs and actual expenditure'*. While the programme administrative systems have improved over time, the 2018 evaluation still found that *'Financial resource absorption is still a challenge as most of the projects have less than 50% budget utilization'*. Based on the 2020–2021 Audit Report, the annual expenditure exceeded the budget by about 10%. While this is not a direct indicator of improved absorption, it does point to significant improvement. The headline finding remains valid because it relates to the planned versus the actual duration of the different phases. Mak still has underlying issues especially with respect to procurement processes vis-à-vis specialised research requirements, which need to be addressed.

The long completion time for PhDs was one of the issues underscored from the first to the last evaluation. By the end of Phase 1, this was 4 to 5 years for those who had completed – and the majority had not completed. The 2014 evaluation pointed to only 20 out of 102 enrolled at the beginning of Phase III having completed. The 2018 evaluation found that *'The majority of PhD students on the programme are mid-way of their studies and significant number are still at the beginner level'*. This particular evaluation recommended that the Doctoral Committee should actually interview the students at the end of each year rather than relying on reports. To enable identifying, tracking and addressing factors that lead to long completion times, QAD, with Sida's support, has developed a web-based tool to monitor and track key student milestones, such as submission of concept and approval, submission of proposal and approval, submission of thesis, thesis examination, viva voce and final clearance for graduation, among others. Feedback from the colleges shows that the process of monitoring student progress is sound and if well implemented can improve students' progress and

increase the chances of students completing on time.

Whether better outcomes could have been achieved from the research cooperation through using the same resources differently, such as the least cost question discussed earlier, is a question that cannot be answered when it comes to such a complex programme of change unless this was planned to be measured against alternative existing models designed to achieve the same end. The earlier evaluations point to areas where increased cost-efficiencies could have been achieved, but it is difficult to link cost-efficiencies to better outcomes. Another area highlighted (2014) is that the programme *'incurred additional managerial and administrative costs for Mak – direct costs for project staff, but indirect costs for participation in Steering and Implementation Committees, separate planning and reporting processes, preparation and participation in supervision and evaluation missions, etc'*. Again, while this could be taken as factually correct, the cost-efficiency that would be achieved by eliminating this does not necessarily link to better outcomes at the programme level and could indeed have a negative impact.

Earlier evaluations found that the programme was not designed in a manner that integrates rigorous monitoring, risk-management and an evaluation framework right from the start, and this weakens any efforts – other than using rigorous quantitative techniques outside the scope of the evaluations – to assess the outcome- and impact-related issues in the OECD/DAC framework. The 2010 evaluation report finds that a *'Lack of an analytic framework from the start, including measurable objectives and predefined indicators of progress, dramatically hindered activity planning, realistic budgeting, and monitoring of progress throughout Phases I & II of this program'*. However, during the final phase of the RCP, Mak developed a results-based matrix with a baseline as well as output and outcome targets.

Mak developed good management and accountability structures that combined the Programme Standard Operating Procedures and a management structure along with 'elaborate and transparent processes for disbursement of funds and procurement of research materials' that, while good safe-guards, reduced efficiency and also slowed implementation. The 2010 evaluation, for example, found that *'Budgets exceeded amounts available, use of funds was slow, re-allocations were not decided, and advances were not always accounted for within a reasonable time'* and that *'stakeholders on the programme including Swedish partners noted with great concern that there were endless delays in procuring items and services on the programme'*. In response to the findings of earlier evaluations²⁰, *'the programme Coordination Office has adopted an elaborate and transparent processes for disbursement of funds and procurement of research materials. Units/researchers have to account for the funds before getting the subsequent releases. Requisition and accountability reports are submitted through the immediate supervisor to the Director DRGT, and the subsequent review and approval process*

20 From interactions with DRGT.

involves the DRGT Director and Accountant, internal audit unit, and the university bursar before a cheque is issued to the respective unit/researcher. In case of research equipment, the assets are engraved prior to passing them on to the units and the units maintain a physical assets register that also tracks the officer responsible for the equipment'. It needs to be noted that while all this is all positive with respect to transparency and accountability, the risk of bureaucratic delays also increases, which would have a negative impact on efficiency.

3.1.5 Impact

Impact was examined from several perspectives, including the extent to which

- i. Mak established the necessary capacity to initiate and coordinate and support research projects.
- ii. Mak established collaborations with regional and international research teams (also applies to individual researchers).
- iii. Research has been integrated into the strategic direction/planning activities and budgets of Mak.
- iv. The programme impacted the academic quality within local PhD programmes.
- v. The programme impacted research characteristics at Mak (e.g., supervision quality, supervisor commitment, student commitment and completion time).
- vi. The programme contributed to improved research capacity at the collaborating Ugandan universities.
- vii. Mak put in place any standing institutional arrangements or processes related to research and PhD training as a result of the programme.
- viii. The programme contributed to creating thematic networks at the national, regional and international levels.
- ix. Unintended positive or negative effects of the programme impacted Mak or individual participants.

It was observed during 2010 that researchers had become more eager and more open to research and research collaboration, giving increased impetus to designing studies and grant seeking. Examples of ongoing and/or new initiatives cited included a Linnaeus-Palme exchange programme between Gothenburg University and Mak; the continuing support to the East African Universities Mathematics Programme (amounting to about SEK3 million per year) through the ISP²¹ led by the University of Uppsala and funded by Sida; the CESH programme between Karolinska University and Makerere; and, more recently (2022), new funding for five PhDs in mathematics under the Norwegian Programme for Capacity Development in Higher Education and Research for Development (NORHED).²²

21 <https://www.isp.uu.se> (accessed: 10 June 2022)

22 <https://www.norad.no/en/front/funding/norhed/> (accessed: 10 June 2022)

Mak has also made substantial progress in developing capacity to coordinate and manage research projects, ranging from policies and procedures to institutional arrangements and systems. Grant Management, for example, is a system to support units in applying for, managing and reporting on the use of externally generated funds for research and graduate education and for managing money and intellectual property. This entails decentralised decision-making and improved financial management as well as academic delivery. Equity goes hand in hand with improved capacity, and achievements in gender mainstreaming have made Mak a model university on gender issues within East Africa. It should be noted that the programme also provided capacity building for administrators who ensure an effective research support environment.

Increased regional and international collaboration is recognised across all evaluations as an aspect that has been very successful, driven by increased visibility due to programme activities and sustained by collaborations arising there from. Citing the 2010 evaluation, *'journal sponsorship and editorial responsibility, recognition in the form of growing numbers of ISI-listed publications, Millennium Science Initiative Awards, and other research prizes, and significant contributions to policy (local, national, and international) characterize the new research culture and environment'*. During the 2014 evaluation, almost half the students believed that the programme partnership nature had to a great extent influenced their collaboration with other researchers.

Mak is harnessing its improved capacity to establish and support collaborations with other academic and research institutions in the region, for example Mak has signed MoUs with the Somalia National University, in Somalia and the University of Juba in South Sudan.²³

While the Mak Strategic Plans (2000/01–2006/07 and 2008/09–2018/19) placed strong emphasis on Mak changing to a research-driven university, including strong focus on the elements that enable this, actual internal funding allocations to research remain limited. Online information states that Mak contributes 1% of its internally generated funds towards research but that the consultants were not able to verify this.²⁴ It is positive that achievements have been made with respect to increasing the number of PhDs (see Figure 4) and therefore researchers and research supervisors. It is interesting to note that the numbers of PhDs often peaked towards the end of a given phase. One can presume that this resulted in increased academic promotions and an increased number of women in research groups. It would help a great deal, while also building up Mak's collaborative capacity, if Mak were to approach the collaboration with PPUs in the same way Sida approached collaboration with Mak. Should any future support be considered for the PPUs, it should be structured along the lines of strengthening their research capacity with Mak as a key player. This would also

²³ Interview with DRGT.

²⁴ <https://www.mak.ac.ug/research/research-funding> (accessed: 10 June 2022)

demonstrate a cascade effect in research capacity building.

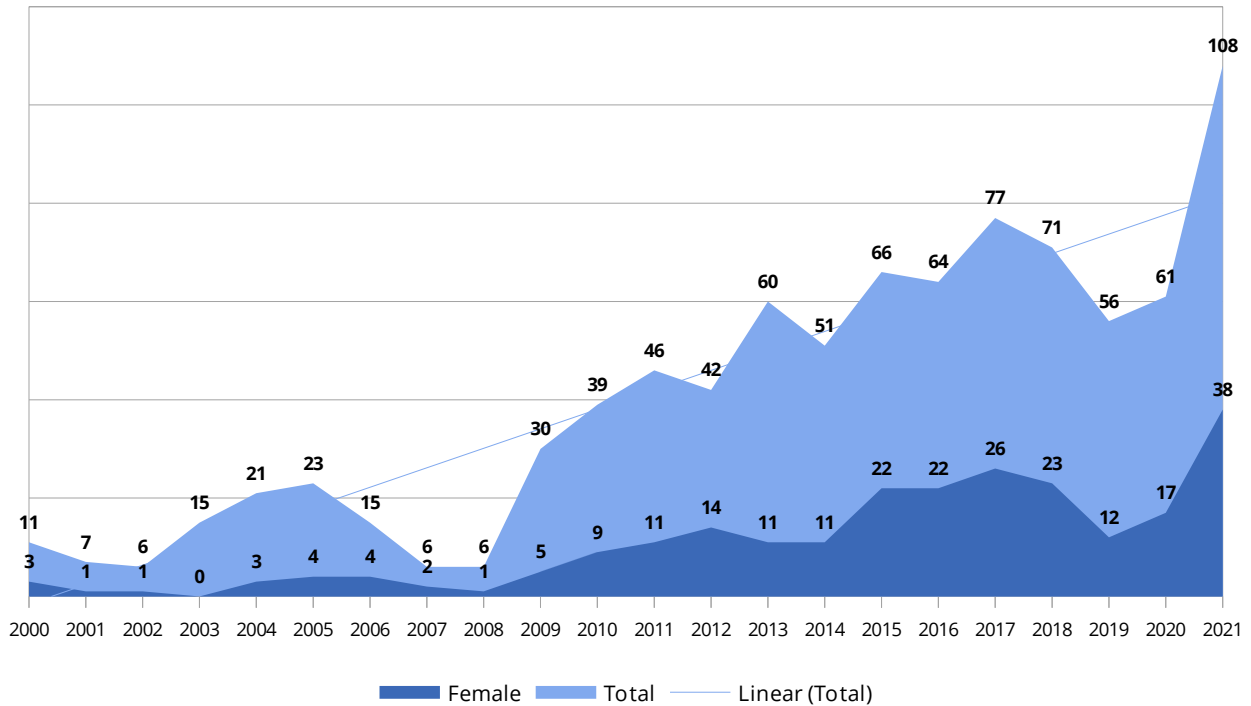


Figure 4: Trends in number of PhD graduates at Mak 2000 to 2021
 Source: Directorate of Research and Graduate Training and Mak Annual Reports

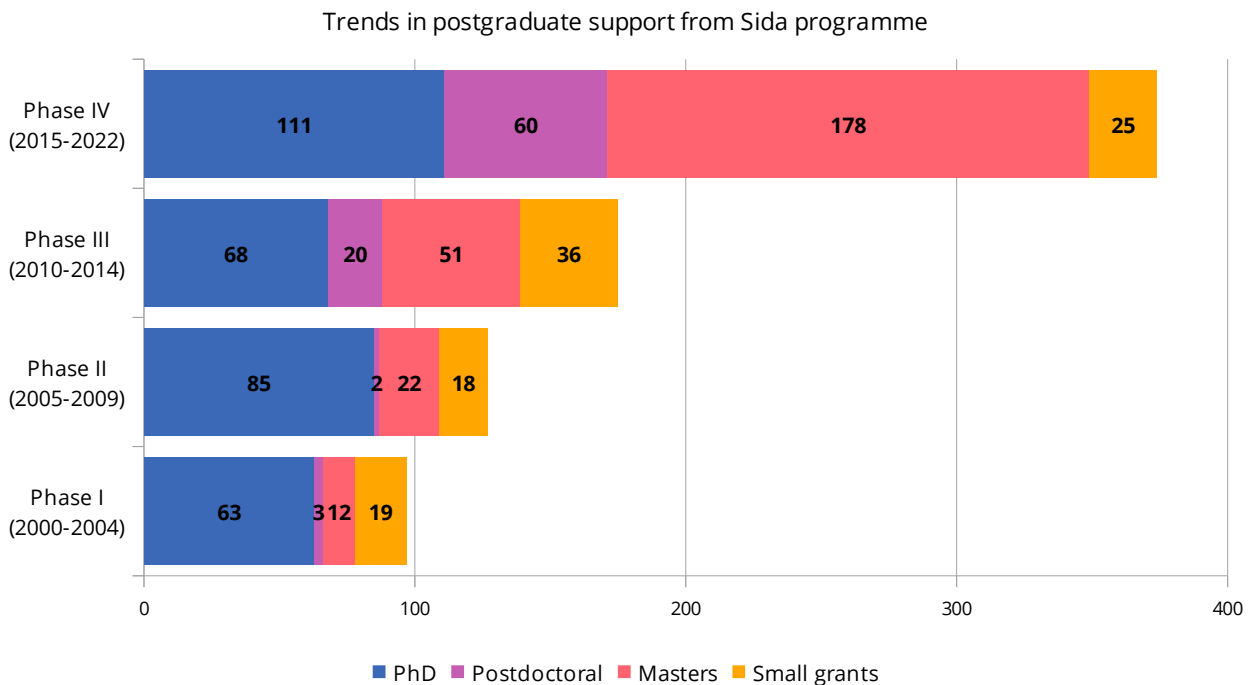


Figure 5: Students and researchers supported under Sida to completion from 2000 to 2022
 Source: Directorate of Research and Graduate Training

The evidence presented in evaluations across the years points to improved academic

quality within local PhD programmes as a major area of success. This goes beyond the volume of publications to an increasing number of these in high-quality, high-impact journals (examples cited included the Journal Environmental Science and Technology (IF = 5,257) and the Journal of Ethnopharmacology (IF = 3,322)); to building supervision capacity; to implementing strong quality assurance policies and processes; and to strengthening/establishing institutions. This is not to say that all has been done, and the 2018 evaluation does point to areas where quality needs to be strengthened, finding, for example that *'the present cooperation between DRGT and QAD did not include all possible/necessary synergies to support graduate studies'* and going on to recommend that QAD and DRGT should *'establish and document a cooperation process that allows Mak to demonstrate the research and graduate training QA process with objectives and indicators'*.

While improved supervision quality and supervisor commitment are subjective qualitative inferences related to the evidenced higher quality and volume of research output, there are objective indications showing a reduction in the duration of PhD studies. Wamala et al. (2011) provide an analysis of PhD completion times for PhD candidates that enrolled between 2000 and 2005 at Mak. By November 2010, 89 candidates had completed their PhD out of the total enrolment (N = 295), resulting in a 30.1% completion rate. Assuming a five-year PhD interval yielded an even lower completion estimate of only 14.9% (N = 44).²⁵ Considering that the students registered under the 2016 cohort of the mathematics PhD programme (N = 12), four had completed by the time of evaluation, a completion rate of 33.3%, according to data from DRGT, and another three had defended their theses. Under the cohort of 2017 (N = 11), six students had submitted their theses for examination by the time of the evaluation.

Out of 382 beneficiaries, PPU benefited from support to 79 PhDs, 124 Masters, 9 Post docs, 3 small grants and improved lab equipment during the final phase of the program. In addition, the PPU had more beneficiaries for the PhD in mathematics. This provides evidence of improved research capacity at the PPU as a result of the collaboration. Other than sending candidates to Mak for training, the PPU did not have any active role in the running or delivery of the programme. As the 2018 evaluation noted, *'The Swedish support has clearly been relevant and useful for Mak for a long period of time, but less so for the other four public universities'*. The final phase of the RCP, however, shows some evidence that that collaboration has started in PhD training, policy development and research, but based on some of the conversations with PPU, much still needs to be done to really strengthen the collaboration.

The collaboration programme triggered, and also supported, a comprehensive overhaul

25 Wamala, R., Oonyu, J., and Ocaya, B. (2011). 'Completion time dynamics of doctoral studies at Makerere University: a hazard model evaluation', *Journal of International Education Research*, 7(3), pp. 49-58. [Online], Available at: <https://doi.org/10.19030/jier.v7i3.4974> (accessed: 10 June 2022)

of the institutional arrangements and processes related to research and all graduate training, leading to a more efficient and effective support environment. This also extended to the training of staff. Institutional arrangements included a new QAD responsible for providing leadership in prescribing, controlling and implementing quality standards (both undergraduate and graduate). The former School of Graduate Studies was reformed as DRGT to make it more effective, underscoring the new research direction of the university. Another organ was the URAFR Committee. This played a key role in reforming policies and processes for the new directions that Mak was taking. The output of URAFR included the *'Organisational and the Research Manual'* launched in 2011, the now-established system of colleges and the Risk and Management Policy.

Key areas of the RCP that made major contributions to and impacted research activity at Mak, and therefore to the achievement of the RCP's objectives, included the participation of Swedish universities and collaborators, the sandwich programme approach to PhD training, cross-cutting courses and institutional support to improve the research environment. The 2010 evaluation found that *'Collaboration with Swedish university colleagues markedly enhanced supervision, publication in the science disciplines, and preparation of a new generation of research mentors for growing the numbers of PhD and master's students'*. The sandwich approach enabled faculty (who were the PhD students) to have extended periods in Sweden where they could focus on research – and at the same time remain anchored in Mak. The 2014 evaluation found that *'Crosscutting courses were a clear and definite success.....were well planned and pedagogically sound, and they offered generic knowledge that all stakeholders perceived as valuable'*. Institutional support addressing the development of new policies and strategies as well as systems for the administrative and academic management at both undergraduate and graduate levels, implementation capacity, ICT services and systems, laboratories and access to online journals and the Demographic Surveillance Site (DSS), among others, was recognised as a key enabling contributor to the achievement of the RCP objectives. Institutional support also led to the development/strengthening of important institutional arms responsible for research and graduate training as well as quality management. It is difficult to objectively isolate which of the areas (including those not highlighted) made the greatest contribution to the achievement of the objectives because collectively they created the synergy that led to the success of the RCP.

3.1.6 Sustainability

Sustainability is discussed from several perspectives that address both status and, where available, trends:

- i. Evidence of increased or available funding from Mak, the Uganda government and

- contracted research to sustain the positive outcomes.
- ii. Evidence that Mak now has effective institutional arrangements and policies to actively seek to grow the university research budget.
 - iii. Evidence that the terms of employment (sufficiency remuneration with respect to cost of living, funded sabbatical leave, incentives such as a share in intellectual property rights (IPR), etc.) have shown shifts that motivate staff to give time to research.

Right from the start, Mak budgeted for sustainability, with the most successful approach initially being ICT services and systems where a technology fee (\$30 USD for undergraduates and \$50 USD for postgraduates) was approved and instituted to sustain attractive staff salaries and planned maintenance – but this later collapsed after 2010, leading to the neglect of preventive maintenance and replacement. The result, for ICT and most of the labs supported by Sida, was deterioration until only replacement, through new Sida funding or funding from other sources, could restore the functioning of facilities. Visits to different installations during this evaluation revealed the same general picture – one notable exception, however, was the Centre for Research in Energy and Energy Conservation (CREEC),²⁶ but even this had several pieces of test equipment overdue for calibration and therefore no longer used.

Due to the increased focus on higher education, there were new positive signs (2018 evaluation) that the government would boost funding for higher education, including Mak, albeit with a focus largely on the sciences. Initiatives then included a student loan scheme for higher education; the rehabilitation and expansion of science, technology and innovation learning facilities in eight institutions, including Mak; and plans for supporting universities to establish and maintain incubation facilities for PhD graduates with promising science and technological innovations. It still remains to be seen whether and to what extent these plans will be implemented in part or in full.

The 2014 evaluation states that *'A major achievement of the Swedish support was the significant enhancement of the academic sustainability at Mak. More staff completed their PhDs, relevant and promising research has been conducted and infrastructure for research strengthened'*. As noted earlier, this, and increased international visibility, is attracting new research funding to Mak. The same evaluation noted that Mak had developed the capacity to train and supervise master's and PhD students using internal resources, a trend that was affirmed by the 2018 evaluation.

Interviews confirmed growing teamwork among researchers, increasingly viable local research groups able to incorporate master's-level students, and external research and collaboration networks that would likely last beyond the programme. Beneficiaries of

²⁶ <https://www.creec.or.ug> (accessed: 10 June 2022)

the PhD programme in mathematics also mentioned improved visibility among their peers and within their discipline, more networking opportunities and a new-found position as a source of inspiration for other young researchers.

The strong institutions, policies and processes supported by ICT-enabled systems are key to sustaining a strong research-support environment, and this was achieved under the RCP. As stated in the 2014 evaluation, *'The university was able to formulate, introduce and implement a broad range of policies, guidelines and financial/administrative procedures making the university more efficient, effective and sustainable'*.

Even though there are some challenges around sustaining the outcomes, as noted in various places in the report, the overall sense from all the evaluations, the strengthening of DRGT, the increasing allocation of internal and government funding for research and the attraction of new research funding all point to a high likelihood of sustaining the outcomes of the RCP. *The establishment of local PhD programmes will also contribute to this. It, however, still needs to be noted that the sufficiency of funding from internal, government and other sources remains one of the highest risks with respect to sustaining the outcomes. The 2018 evaluation particularly highlighted '...mixed results with regards to sustainability of the established infrastructure. A lot will depend on access to sufficient operational funding for DICTS, the GIS lab, the library and the MUCHAP. The library will need more librarians to be trained...'*

It is a positive that the annual appraisal aspects for academic staff now include research, but the perennial challenge of time allocation between teaching and research highlighted in previous evaluations does not seem to have been formally addressed. While Mak has well-defined hours that each lecturer is required to give, no minimum is stipulated for research. This gap needs to be addressed so that rather than simply using publications as an indicator, the process aspect of spending sufficient time on research is also included.

After a series of strikes, the government of Uganda took steps to increase the pay of academic staff, especially at the professorial levels, with current (2022) pay for a professor being the equivalent of about USD 4,500, up from about USD 2,000 10 years earlier. This was certainly a positive step, but the salary levels are still very low and are not competitive with respect to the private sector, especially in the sciences. By 2010, most of the highest academic positions remained vacant, and the 2018 evaluation found that due to *'the growing demand for skilled knowledge workers, the universities have to compete with the public and private sectors for talent.... participating public universities identified staff retention as critical issue of maintaining the desired human capacity in service'*.

All the evaluations confirm that Mak's research is now relevant to Uganda's national development needs albeit with concern about the utilisation of the research output to

that end. As stated in the 2014 evaluation, *'up scaling and uptake of research results outside project sites was still weak'*. Until there is a demonstrable and impactful uptake of research output in ways that impact national development, increased funding from the government will remain tenuous.

3.1.7 Unintended Outcomes

Based on interviews with programme participants, there were several positive unintended outcomes, including improved quality assurance as a result of joint degrees and positive impacts on the research agenda at the faculty level. There was also *'an emergence of research themes and teams producing work highly relevant to reducing poverty and hastening development, increasing openness among researchers and commitment to continuing research as a regular feature of university life'*. Academic staff were additionally said to be increasingly sought after by the government as experts and resource persons.

While the focus on sciences aligned with national development priorities, an unintended negative consequence is that the humanities-based faculties have been left behind in terms of research output. It is true that science is critical for development. It nevertheless needs to be emphasised that the sciences and humanities must come together to achieve holistic national development.

3.1.8 General Findings

The evaluations over the years revealed several challenges that can provide lessons (italicised below) for future similar collaborations with Uganda or elsewhere:

- i. Within the area of research support, and from the perspective of students, a key challenge was the limited time that Uganda-based research supervisors had for them, which could be attributed to both overload and a carry-over from the old culture. Related to this was a lack of specialised knowledge. The students additionally reported being challenged by balancing work at Mak, research and family financial support. There was also a challenge with course scheduling, which was said to be sometimes abrupt. *This might relate to a challenge that had emerged as a kind of culture in Mak where timetabling, particularly for graduate studies, followed the convenience of the lecturer as opposed to being run according to a university-wide timetable.*
- ii. While well-intended, the manuals and guidelines around the RCP introduced bureaucratic processes that led to delays and an under-utilisation of funds. This improved over time, but the funds under-utilisation remained a challenge to the end. There was also a significant demand on the time of DRGT staff as well as on that of the coordinators in different units. *This relates to change management. The RCP set out to support a cultural change in Mak, and change management should have been an integral*

component of programme development from the start. Similar interventions need to take this into account.

- iii. The 2014 evaluation pointed to the fact that the RCP was focused on strengthening only internal Mak processes, not 'the national policies, institutional structures and financing of higher education including researcher training and research'. Any future programme of this magnitude, or even smaller, should place considerable emphasis on achieving impact at the national level; until this happens, failure to sustain outcomes will always be a major risk.*
- iv. The long completion times were variously attributed to the internal structure of the PhD programmes; to the fact that students never actually received time off from their academic and administrative assignments (this was the plan, but this never happened, maybe because of staffing shortages at Mak); to the unavailability of Mak supervisors (in the current evaluation, a PhD student at one of the schools said it had taken more than a year after submitting her research proposal to receive confirmation that she could proceed with her research); to personal and family issues (which appear to relate to the insufficiency of remuneration and the need for staff to raise income from other sources); and to inadequate knowledge of students about their research areas. While proposals have been made in some recommendations to ensure shorter completion times through more effective monitoring, it is evident that several other underlying issues will need to be identified and addressed.*
- v. In addition to having new PhDs, the final phase of the RCP does show some evidence that that collaboration has started in PhD training, policy development and research, but based on some of the conversations with PPUs, much still needs to be done to really strengthen the collaboration. This has addressed the reservation found in earlier evaluations about PPUs deriving benefit from the programme. It would help a great deal, while also building up Mak's collaborative capacity, if Mak were to approach this collaboration with PPUs in the same way Sida approached collaboration with Mak. Should any future support be considered for the PPUs, it should be structured along the lines of strengthening their research capacity with Mak as a key player. This would also demonstrate a cascade effect in research capacity building.*

3.2 Findings Based on Site Visits

Site visits to physical infrastructure facilities were conducted to get a sense of the state of the facilities, which provides opportunities to interact with the front-line users and back-end staff – an opportunity for insights into utilisation, benefits and challenges.

The evaluation team conducted site visits to various infrastructure facilities that had been set

up or funded in part by the programme at the following colleges:

- i. College of Engineering, Design, Art and Technology (CEDAT)
- ii. College of Health Sciences (CHS)
- iii. College of Veterinary Medicine, Animal Resources and Bio-security (COVAB)
- iv. College of Natural Sciences (CONAS)
- v. Directorate for ICT Support (DICTS)
- vi. Main University Library.

3.2.1 CEDAT

The Centre for Research in Energy and Energy Conservation (CREEC) at CEDAT, which had received Sida support in terms of lab equipment during Phase III, is the only Ugandan lab to receive both ISO certification and Uganda National Bureau of Standards (UNBS) certification in renewable energy technologies. While the lab was sustainable in terms of running their operations, it was evident that they had challenges with the calibration of equipment and would struggle to replace the lab equipment as it reaches end of life. The team also visited the GIS lab for graduate students, which had been equipped with high-end computers and two plotters through the programme. Sadly, some equipment, such as the plotters, were still in their original packaging, highlighting that it had not yet been put to use for the students.

3.2.2 CHS

Visits were made to both the Department of Microbiology and the Department of Immunology and Molecular Biology at CHS. Both of these had received funding for high-end lab equipment for various labs. While both had managed to identify other funding sources for lab equipment, some of the equipment that the programme had funded (e.g. the Phoenix 100) were very expensive, and Microbiology, in particular, was having challenges in replacing their equipment, which had broken down and had already been superseded in terms of technology improvements. The programme had also provided Class II biological safety cabinets for another lab in Microbiology, enabling the lab to run at the BSL-3 level.

3.2.3 COVAB

The programme had funded a variety of equipment in a number of laboratories. It was evident that the college had managed to secure a variety of funding sources for lab equipment (including from the government of Uganda through grants from the African Development Bank (GOU/AfDB)). COVAB also had a Biosafety Level 3 (BSL-3) lab, the Biotech and Microbial Applications lab setup under the Presidential Scientific Initiative on Epidemics (PRESIDE), a brainchild of President Yoweri Museveni on the development of a COVID-19

vaccine. This is one of very few labs in Uganda set up to operate at the BSL-3 level.

3.2.4 CONAS

The Department of Chemistry, like other benefiting units, had been able to identify other sources of funding for complimentary lab equipment, including GOU/AfDB. A major challenge for the department was the lack of a sufficient number of instrument technicians to maintain and service the lab equipment after Mak retired most of the old technicians on reaching retirement age. Ironically, the department was occasionally forced to hire these retired technicians as consultants to service some of the lab equipment.

3.2.5 DICTS

The Huawei FusionModule800, a modular data centre funded under the RCP, provides the university with a compact backup data centre, which replaced the old one originally deployed in CONAS. This is new and clearly very costly, which means Mak needs to have forward-looking plans for planned maintenance and upgrades or obsolescence.

3.2.6 Main Library

The main Library has a wide range of digital computing hardware, still operational, that was funded under the programme. This included a drop-book scanner, flatbed scanners, high-speed photocopiers, high-end computers and digital storage. While most of the equipment was largely used to digitise documents in paper form, the use of photocopiers was notable in that students were permitted to make free copies of portions of particularly rare or high-demand books that they were not allowed to borrow in order prevent vandalising the books by tearing out pages, a vice that was destroying library resources. The programme also used to pay for Virtua, an integrated library system used to manage the library catalogue, but now the university has taken this up and budgets for the annual subscription. The library has been able to build on this to secure funding from other sources, including GOU, to fund e-resources across the library. Because of its increased capacity to curate and manage e-resources, the library is also at an advanced stage of implementing a policy that will require students to submit digital copies of their dissertations or theses alongside the usual physical copies.

3.2.7 Key Findings

The key finding that emerged from the site visits is the insufficiency or absence of funding for planned maintenance and repairs or replacement required by obsolescence. The accumulation of non-functional and often obsolete equipment points to the inability to dispose of them because (as indicated by one of the staff members) university policies have made the disposal of old and non-functioning equipment difficult.

Additionally, outside the occasional exception, many of the laboratories were in a sorry state of maintenance, and most laboratories were empty or devoid of researchers. While this could have been ascribed to COVID-19, a faculty member at one of the locations attributed this to the many graduate students being part-time: *'Graduate students now have to pay tuition for their own education. Often, most students do this part-time as they also workday jobs to fund their own upkeep'.*

4. Taught PhD Programme in Mathematics

The earlier evaluations did not look at the taught PhD in mathematics in depth because it was just starting. The main evaluations do make a reference to it, but this specific focused evaluation, coming after some students had completed the graduation process, was intended to provide more insights.

As a background note, the origins of the taught PhD in mathematics can be traced to 2002, when the Eastern Africa Universities Mathematics Programme (EAUMP) was formally launched by the ISP that is hosted and led by the University of Uppsala with funding from Sweden. EAUMP was launched with the major aim of *'increasing the contribution of mathematical research and training to sectors important for local and global development'*. The total ISP support to EAUMP for the period 2002–2016 was 29,259,902 SEK (approx. USD 3.12M).

The EAUMP network (through the ISP support) set a precedent for the RCP in so far as PhD training in mathematics is concerned. It specifically played a transformative role in terms of building mathematics research and teaching capacity, introducing new areas of mathematics and strengthening existing ones. It also facilitated the consolidation and establishment of emerging research groups. Furthermore, none of the institutions in the network run a taught PhD programme and were thus faced with shortages in supervision. The network facilitated the establishment of the sandwich programme, which was later adopted in the bilateral programme. It is against this backdrop that the taught PhD in mathematics was developed under the bilateral programme.

4.1 Findings from the Student Survey

4.1.1 Overview

The DRGT at Mak provided a list of 20 PhD student beneficiaries of the programme who were targeted to participate in the evaluation through an online survey. Of these, 11 students provided full responses, a response rate of 55%, which is sufficient to provide views that can be extended across the group. Ten of the respondents were from the PPU, and 54.5% had completed their PhD by the time of the survey.

All student beneficiaries confirmed that the programme's design and objectives responded to

their needs and priorities. Students had varying levels of satisfaction with different components of the programme as illustrated in Figure 6.

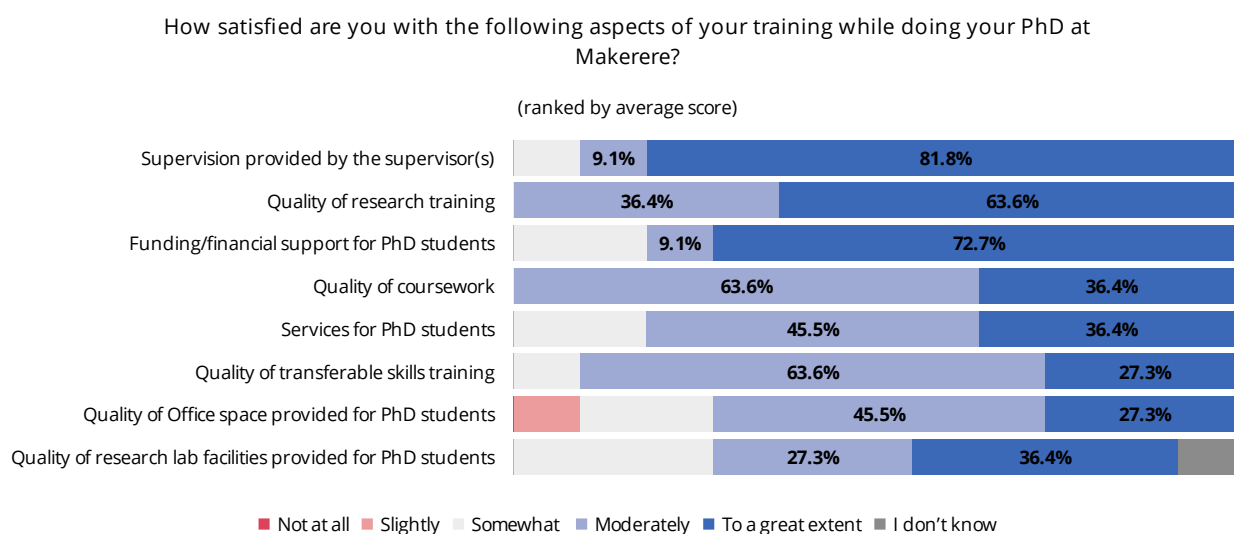


Figure 6: Satisfaction among students in the PhD Programme in Mathematics

Students were most satisfied with the supervision, followed by the quality of research training. Almost all students (10 of the 11) indicated that the programme had increased their capacity in terms of research (including publications), and eight felt that the programme had improved their teaching capabilities.

Among the respondents, all students that had started their PhDs in 2016 had defended their theses. Among the students that had started in 2017, only three out of eight students (37.5%) had defended their theses.

While most students indicated that they would complete their PhDs within the planned timelines, this is unlikely to be the case since the programme was designed to last five years (2 years for coursework and 3 years for research). Students who started in 2017 and were yet to complete had until June 2022 to have defended their final theses.

Two students complained about the long wait between the submission of their final dissertation and the formal defence, with one indicating that they had waited for over a year, creating much anxiety. This was also corroborated by one of the faculty from one of the PPUs. This is clearly one of the key quality management issues that need to be addressed.

4.1.2 Impact of the Programme

Understanding the impact of the programme is something that will take many more years. To get a sense of this, the evaluation team asked students to rate future-oriented statements relating to their performance, which are summarised in Figure 7. All the students (100%)

planned to continue networking/collaborating with colleagues they had met through the programme, indicating that the research and collaboration networks built are likely to be one of the enduring features that will last beyond the end of the programme.

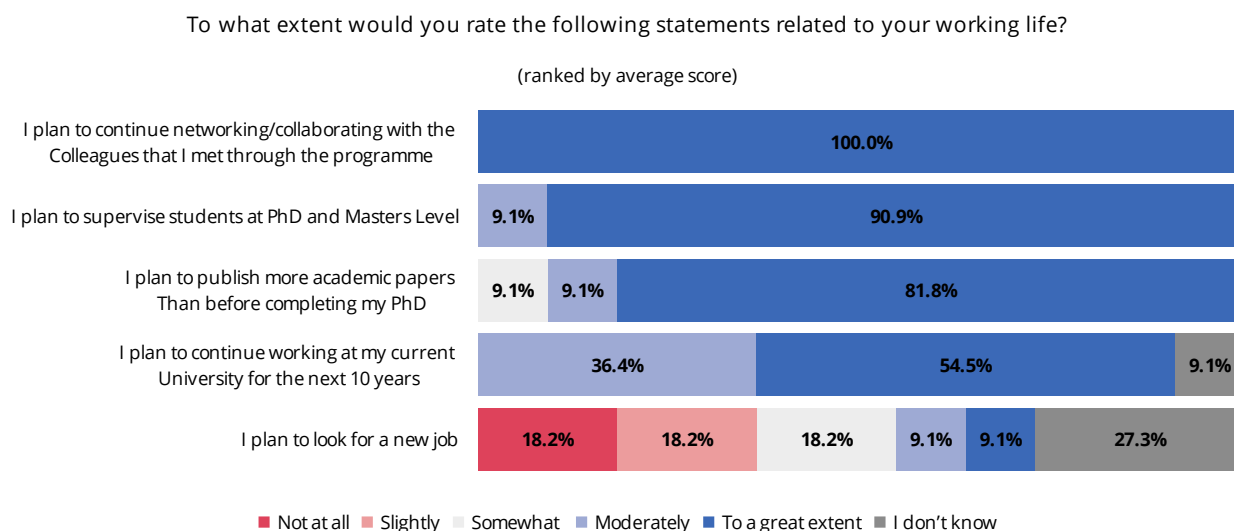


Figure 7: Student ratings on the potential impact of the programme

Most PhD students plan to supervise students at both the PhD and MSc levels (90.9%) and to publish more academic papers (81.8%), both activities that will have a multiplier effect in terms of impact.

In terms of unintended effects, on the positive side, students mentioned improved visibility among their peers and within their discipline, more networking opportunities and their position as a source of inspiration for other young researchers. On the negative side, one student mentioned having less time for their family caused by increased research activity, while another student mentioned that they were still a part-time staff member at their university and planned to look for a new job with a permanent position given their new acquired qualifications.

4.1.3 Enhancing the Programme

The survey asked students for ideas on how their experience as a PhD student in the programme could have been improved, and they made a number of suggestions, as follows:

- An improved student stipend, especially for those students that were not yet on an institutional payroll. This would enable students to better focus on their studies without having to worry about how to make ends meet.
- Provide better linkages and networking opportunities with other researchers working on similar research problems.

- Organise cross-cutting courses specifically for mathematicians and, where possible, get a mathematician to teach the students these courses. For example, a student indicated that a mathematician should teach students in regard to the course research methods so that they can be able to provide more appropriate examples.
- Provide breadth and flexibility to allow students to select and study courses specifically in their area of interest.
- Improve some processes around the final examination of the dissertation and clearing for graduation so that they are more predictable and clearer.

Over half of the students expressed gratitude for the opportunities that the programme had afforded them, and they hoped that in future, similar programmes would emerge for the benefit of other students that had not benefited from this particular opportunity.

4.2 Findings from Faculty

The DRGT at Mak provided a list of local faculty members that supported the programme. The evaluation team engaged faculty using both interviews and an online survey.

All faculty who were interviewed or who had completed the survey indicated that, to a great extent, the programme had responded to their needs and priorities as part of the faculty leading the PhD programme in mathematics. They had all interacted with Swedish universities or institutions during the program, and many were grateful for the support they had received to attend conferences and seminars as well as to publish academic papers.

One faculty member from outside Uganda appreciated the opportunity to participate in the programme and felt that this gave the programme an international outlook. As one participant noted, *'It (the programme) provided an opportunity to train 21 PhDs and that is not something small'*.

All the faculty that the evaluation team interacted with indicated that the programme had to a great extent positively influenced the conduct of research at Mak and increased the number of publications produced by the university. One highlighted that the programme had *'broadened his research area to include Mathematical statistics'*, while others acknowledged improved collaborations with regional and international research teams and, to a lesser extent, better research funding and support at the university.

While the programme helped improve the research infrastructure in the department, particularly in terms of computers, some faculty noted that there are still gaps that the University needs to address. As one member put it, *'Mak still lacks sufficient software for analysis and access to high-end computing resources (super computers)'*.

Two senior faculty members intimated that following internal evaluations and reflection, some faculty felt that the programme was perhaps too long. There are ongoing internal deliberations to shorten the programme; for example, instead of two years of coursework followed by two years of research, this could be shortened to one year of coursework followed by two years of research. One stated, *'Revise the curriculum to remove some courses. Especially reduce the pure maths courses to include applied mathematics'*.

4.2.1 Impact/Sustainability

'Enrolling 20 PhD students on the same programme in one subject, this had never happened at Mak'.

Faculty talked about the tremendous improvement in PhD completion times at Mak. They attributed this partly to improvements in the research environment orchestrated by the better policies and guidelines implemented by DRGT, many of which have been driven by the programme. As one faculty underscored, 'there were 120 PhD graduates at the last graduation (actual number was 108) and I expect this to grow!'

All faculty acknowledged increased research collaboration with both local and international colleagues and indicated that the networks they had built would continue even beyond the Sida programme. Some faculty members cited this as an unintended positive effect of the PhD programme. To quote a participant, *'we thank Sida for the support and giving us a hand, so we should be able to move on from here'*.

Other positive signs cited by a number of participants included the following:

- The programme increased collaboration among local public universities
- Participating universities have been able to successfully identify other sources of funding to undertake similar programmes, such as NORHED II funding to train five PhD students (Mak). Although they acknowledged that the target number was much smaller compared to that under the programme, they recognised this as a good start.
- Gulu University has also set up a collaboration with Bradford University in the United Kingdom, where students who successfully complete their PhD can go for a six-month sabbatical to publish papers emanating from their PhD thesis.
- Both faculty and students have been able to apply for funding from other sources; while only a few of these had been successful, they were optimistic about their chances in the future.
- Some of the beneficiaries that had completed their PhDs successfully had received promotions at their universities.

4.2.2 Enhancing the Programme

During interviews, the evaluation team asked faculty for ideas on how their experience as faculty supporting the programme could have been improved. They made a few suggestions, as follows:

- The programme should provide more teaching opportunity for local faculty, instead of leaving this to only the International faculty.

I would involve more of the local teachers who can teach courses throughout the 16 weeks of the semester rather than giving students short courses from visiting lecturers.

Teaching was limited and was mainly for colleagues from Sweden, local faculty mainly supervised students.

- Faculty felt that there is need to provide financial incentives for local collaborators supporting such programmes. Although Mak pays them a salary and factored this into the programme as its contribution, recognition for the supervision and support of PhD students is still not commensurate with the amount of effort that faculty need to invest in this process.

That one (financial incentives) almost caused problems because local supervisors were not catered for. People were not very happy about this, but that is what Mak could offer.

- There was a sense among a number of faculty members that such programmes need to be restructured to reduce the amount of time dedicated to upfront coursework from two years to one year. In addition, students should be encouraged to think about their research problems right from the onset of the programme as opposed to waiting until the coursework is completed.

I would straightway motivate students to develop their research problems from the start of the programme rather than waiting until they finish the coursework.

5. Summary of Findings, Recommendations, and Conclusions

This chapter provides a summary of the findings based on all aspects of the evaluation, presents responses to the key questions raised in the TOR and gives key recommendations as well as concluding remarks.

5.1 Findings based on the OECD/DAC Framework

5.1.1 Relevance

Four different evaluations from 2010 and 2018 affirm that the programme was responsive to the needs and priorities of Mak, with oversight responsibility being vested in the Mak Steering Committee. The common finding among all the evaluations from 2010 to 2018 was that the programme was consistent with national priorities regarding poverty, gender equity and development. The last evaluation, in 2018, was more specific about national level relevance:

The programme was aligned to the government of Uganda's national development plan of transforming Uganda into a middle-income, knowledge-based economy based on the analysis of the national development frameworks. It also addressed the critical needs of the higher education sector in Uganda, as the country still has a greater need for PhD holders to support the rapidly expanding higher education sector.

5.1.2 Coherence

It is evident that in addition to being the largest funder during the life of the programme, there was alignment of intent and interventions across multiple development partners. Other development partners included the Norwegian Agency for Development Corporation (NORAD); the Dutch organisation for internationalisation in education (NUFFIC); private foundations such as the Carnegie Corporation of New York, the Rockefeller Foundation; and many others. One of the evaluations (2014), while recognising coherence in terms of directing support to the same needs, did however express some reservations about the absence of programme-level coordination across the development partners as even Sida conducted a level of consultation with all. In terms of gender equality, the programme by design defined principles of fairness in the selection of project beneficiaries and participants and emphasised respect for human rights as enshrined in the

Universal Declaration of Human Rights adopted by the United Nations and the constitution of the Republic of Uganda.

5.1.3 Effectiveness

A longitudinal examination of the various evaluations reveals increasing improvement of the processes related to research over the last 18 years to the current status such that they can be considered entrenched albeit subject to continuing review and improvement. Similar to administrative processes related to research, there has also been significant improvement in the processes related to PhD training. The early years of the programme led to the establishment of manuals for the supervision of graduate students in some faculties. By 2014, it was found that the *'Processes for following up PhD students are elaborate and ensure quality. Also, four research ethics committees were established at the College of Health Sciences and approved by Uganda's National Council of Science and Technology'*.

The findings of the different evaluations have also been consistent in affirming that the programme achieved its design objectives. Especially lauded was Sida's approach, which distinguished itself by placing emphasis on capacity, including addressing the research environment.

It is very likely that a key factor in increasing Mak's international visibility and ranking is the increased number of research publications, something to which Sida, as the main funder for research capacity building and research, is a major contributor. The establishment of policies, procedures and standards to guide research and research management and institutional arrangements such as DRGT and QAD should be able to ensure continuing improvement.

In addition to having new PhDs, the final phase of the research collaboration programme (RCP) does show some evidence that the collaboration started in PhD training, policy development and research, but based on some of the conversations with public partner universities (PPUs), much still needs to be done to really strengthen the collaboration. Progress made during the final phase has addressed the reservation found in earlier evaluations about PPUs not deriving significant benefits from the programme.

5.1.4 Efficiency

The least cost question is almost impossible to respond to conclusively as it relates to a complex intervention that was not just about providing funding for research but also for supporting the transformation of the entire research environment. It is therefore not surprising that while all the evaluations touched on different aspects of how costs could be reduced, there was no answer then, nor is there one now, to this question.

The programme objectives were not achieved within the planned timelines, ascribed largely to the under-utilisation of funds due to weak management and implementation processes. While the programme administrative systems have improved over time, the 2018 evaluation still found that *'Financial resource absorption is still a challenge as most of the projects have less than 50% budget utilization'*. It is evident from this that Mak still has to address underlying issues related to procurement, especially where this relates to research.

Whether better outcomes could have been achieved from the research cooperation through using the same resources differently, such as the least cost question discussed above, is a question that cannot be answered when it comes to such a complex programme of change unless this was planned to be measured against alternative existing models designed to achieve the same end. The earlier evaluations point to areas where increased cost-efficiencies could have been achieved, but it is difficult to link cost-efficiencies to better outcomes. Earlier evaluations found that the programme was not designed in a manner that integrates rigorous monitoring, risk-management and an evaluation framework right from the start, and this weakens any efforts – other than using rigorous quantitative techniques outside the scope of the evaluations – to assess the outcome- and impact-related issues in the OECD/DAC framework.

5.1.5 Impact

Researchers have become more eager and more open to research and research collaboration, giving increased impetus to designing studies and grant seeking. Increased regional and international collaboration is recognised across all evaluations as an aspect that has been very successful, driven by increased visibility due to programme activities and sustained by collaborations arising out of that.

The evidence presented in evaluations across the years points to improved academic quality within local PhD programmes as a major area of success. This goes beyond volume of publications to an increasing number of these in high-quality, high-impact journals.

The collaboration programme triggered, and also supported, a comprehensive overhaul of the institutional arrangements and processes related to research and all graduate training, leading to a more efficient and effective support environment. This also extended to the training of staff.

Key areas of the RCP that made major contributions to and impacted research activity at Mak, and therefore to the achievement of the RCP's objectives, included the participation of Swedish universities and collaborators, the sandwich programme approach to PhD training, cross-cutting courses and institutional support to improve the research environment. The sandwich approach particularly enabled faculty (who were the PhD students) to have extended periods in Sweden, where they could focus on research –

and at the same time remain anchored in Mak. Institutional support, addressing the development of new policies and strategies as well as systems for the administrative and academic management at both undergraduate and graduate levels, implementation capacity, ICT services and systems, laboratories and access to online journals and the DSS, among others, was recognised as a key enabling contributor to the achievement of the RCP objectives.

5.1.6 Sustainability

Right from the start, Mak budgeted for sustainability, but this later collapsed after 2010, leading to the neglect of especially preventive maintenance and the replacement of equipment where infrastructure interventions had been funded. Due to the increased focus on higher education, there are positive signs that the government will continue boosting funding to higher education albeit with a focus largely on the sciences. Increased international visibility is also attracting new research funding to Mak.

The strong institutions, policies and processes supported by ICT-enabled systems are key to sustaining a strong research-support environment, and this was achieved under the RCP. Even though there are some challenges around sustaining the outcomes, the overall sense from all the evaluations, the strengthening of DRGT, the increasing allocation of internal and government funding for research and the attraction of new research funding all point to a high likelihood of sustaining the outcomes of the RCP. It, however, still needs to be noted that the sufficiency of funding from internal, government and other sources remains one of the highest risks with respect to sustaining the outcomes.

Interviews confirmed growing teamwork among researchers, increasingly viable local research groups able to incorporate master's-level students, and external research and collaboration networks that would likely last beyond the programme. Beneficiaries of the PhD programme in mathematics also mentioned improved visibility among their peers and within their discipline, more networking opportunities and a new-found position as a source of inspiration for other young researchers.

It is a positive that the annual appraisal aspects for academic staff now include research, but the perennial challenge of time allocation between teaching and research highlighted in previous evaluations does not seem to have been formally addressed. While Mak has well-defined hours each lecturer is required to give, no minimum is stipulated for research. This gap needs to be addressed so that rather than simply using publications as an indicator, the process aspect of spending time on research also becomes an element.

After a series of strikes, the government of Uganda took steps to increase the pay of academic staff, especially at the professorial levels, with current (2022) pay for a professor being the equivalent of about USD 4,500. This was certainly a positive step, but

the salary levels are still not competitive with respect to the private sector, especially in the sciences. The 2018 evaluation found that due to *'the growing demand for skilled knowledge workers, the universities have to compete with the public and private sectors for talent... participating public universities identified staff retention as critical issue of maintaining the desired human capacity in service'*. This underscores the continuing reality that training PhDs without addressing potential risks of staff turnover might not address the current human capital challenge in Mak as well as other public universities.

All the evaluations confirm that Mak's research is now relevant to Uganda's national development needs albeit with concern about the utilisation of the research output to that end. Until there is a demonstrable and impactful uptake of research output in ways that impact national development, increased funding from the government will remain tenuous.

Unfortunately, the insufficiency or absence of funding for planned maintenance and repairs or replacement of equipment (ICT and labs) remains a major gap. The accumulation of non-functional and often obsolete equipment points to the inability to dispose of them because (as indicated by one of the staff members) university policies have made the disposal of old and non-functioning equipment difficult.

5.1.7 Unintended Outcomes

Based on interviews with programme participants, there were several positive unintended outcomes, including improved quality assurance as a result of joint degrees and positive impacts on the research agenda at the faculty level. There was also *'an emergence of research themes and teams producing work highly relevant to reducing poverty and hastening development, increasing openness among researchers and commitment to continuing research as a regular feature of university life'*. Academic staff were additionally said to be increasingly sought after by the government as experts and resource persons.

While the focus on sciences aligned with national development priorities, an unintended negative consequence is that the humanities-based faculties have been left behind in terms of research output. It is true that science is critical for development. It nevertheless needs to be emphasised that the sciences and humanities must come together to achieve holistic national development.

5.2 Key Findings Based on Site Visits

The key finding that emerged from the site visits is the insufficiency or absence of funding for planned maintenance and repairs or replacement required by obsolescence. The accumulation of non-functional and often obsolete equipment points to the inability to dispose of them because (as indicated by one of the staff members) university policies have

made the disposal of old and non-functioning equipment difficult.

Additionally, outside the occasional exceptions, many of the laboratories were in a sorry state of maintenance, and most laboratories were empty or devoid of researchers. While this could have been ascribed to COVID-19, one of the faculty members at one of the locations attributed this to the many graduate students being part-time: *'Graduate students now have to pay tuition for their own education. Often, most students do this part-time as they also workday jobs to fund their own upkeep'*.

5.3 Key Findings Related to the Taught PhD in Mathematics

All beneficiaries confirmed that the programme's design and objectives responded to their needs and priorities as PhD students. They had varying levels of satisfaction with different components of the programme, indicating most satisfaction with the supervision, followed by the quality of research training. Almost all students (10 of the 11) indicated that the programme had increased their capacity in terms of research (including publications), and eight of the 11) felt that the programme had improved their teaching capabilities.

While most faculty members and students were optimistic that students would complete their PhDs within the planned timelines, this is unlikely to be the case. Only three out of eight students who started in 2017 had defended their final theses; the rest had until June 2022 to ensure timely completion (programme designed to last 5 years: 2 for coursework and 3 for research). In addition, two students and one faculty member did complain during the interviews about the long wait between the submission of the final dissertation and holding of the formal defence, highlighting a key quality issue that needs to be addressed.

Students and faculty were proud and appreciative of the research and collaboration networks built through the programme, and all planned to continue leveraging their networks for research. Most PhD students also planned to supervise students at both the PhD and M.Sc. levels at their universities. Such activities will have a multiplier effect in terms of impact, which is likely to last beyond the end of the programme.

Over half of the students expressed gratitude for the opportunities that the programme had afforded them, and they hoped that in future, similar programmes would emerge for the benefit of other students who had not benefited from this particular opportunity.

5.4 Findings Regarding Key Questions

5.4.1 Current Planning for the Sustainability of Research Training at Mak and Other Supported Universities in Uganda

Mak now has in place the qualified human resources as well as the policies and procedures, systems and institutional arrangements required to plan for and sustain a strong research and research training environment – and continuing review has been incorporated into these. From the various reviews, a strong culture of research has also evolved, at both the institutional and researcher levels. The weak area noted in the evaluations is the continuing failure to plan for and allocate sufficient funding to research.

Out of 382 beneficiaries, PPU benefited from support to 79 PhDs, 124 Masters, 9 Post docs, 3 small grants as well as improved lab equipment during the final phase of the program. This provides evidence of improved research capacity at the PPU as a result of the RCP. While the PPU had more beneficiaries for the PhD programme in mathematics, the delivery of the programme appears to have been one way. Using the same resources, the taught PhD implementation could have been designed in a way that also built more research and research training capacity at the other public universities.

Regional and international research team collaborations have been established as evidenced by multiple sources of funding both for equipment and research along with collaborations. These sources include the East African Universities Mathematics Programme (EAUMP) supported by the ISP under the University of Uppsala, which played a major role in the starting of the PhD programme in mathematics, and the CESH between Makerere and Karolinska.

5.4.2 Achievement of Better Outcomes

Taking into account the research context in Mak, Uganda, and the Region at the time RCP started, it is difficult to conceive a more efficient way in which better outcomes could have been achieved. The direct collaboration with Swedish universities built up skills for research supervision while at the same time generating new PhD graduates. The exchange visits were an essential part of this. The programme management structures used enabled Mak to strengthen its own research programme management structures. Without the institutional support (development of policies and procedures, strengthening internal institutions, the library, ICT support, capacity building for managerial and administrative staff), the research environment would not be positioned to sustain outcomes.

The only aspect that could have been added would have been using the RCP to leverage improvements in the national research environment so that more funding for research from the government would be made available. This could incorporate an approach to funding predicated on counterpart funding from government right from the start (cash rather than the in-kind approach that was used). Such an approach could be structured with Sida funding starting low during the early phases where there is major focus on institutional support (policies, procedures, institutions, and systems have to be built to a level capable of supporting research); scaling up with major focus on research and research capacity building; and scaling down as national government funding takes up the load on an increasing basis.

5.4.3 Impact on the Local PhD Programmes

The quality of the local PhD programmes was not directly evaluated, but it can be stated through inference that their quality has improved significantly. This is based on the improvements in the internal support environment, the quality of supervision along with internal quality management, and the high ranking in high impact publications as discussed in this report. While the taught PhD programme is still in its early years, discussions with staff involved in the programme indicate that the approach and methodology is going to feed into all other PhD programmes. This programme has also generated a lot of publications.

5.4.4 Supervision Quality, Commitment, and Completion Time

Based on the volume and quality of publications, the shorter completion terms, and the increasing number of PHD graduates, it can be inferred that supervision quality and commitment have improved. Other than the clear current move to shorten duration of the taught PhD programme in mathematic noted during the current evaluation, the earlier evaluation do not indicate whether or not policy, procedures, and standard were reviewed to recognise the positive changes and therefor institutionalise whatever led to them. This is an area that DRGT could focus on the cycle of review of policies, procedures, and standards that is said to be ongoing.

5.4.5 Improved Research Capacity at the Collaborating Ugandan Universities

In addition to having new PhDs, the final phase of the research collaboration programme (RCP) does show some evidence that the collaboration started in PhD training, policy development and research, but based on some of the conversations with public partner universities (PPUs), much still needs to be done to really strengthen the collaboration. This has partly addressed the reservation in earlier evaluations about PPUs deriving benefit from the programme.

5.4.6 Sustainability of the Research Environment and Research Training

Even though there are some challenges around sustaining the outcomes, as noted in various places in this report, the overall sense from all the evaluations, the strengthening of DRGT, the increasing allocation of internal and government funding for research and the attraction of new research funding all point to a high likelihood of sustaining the research environment and research training at Mak. The local PhD programmes established will be major contributors to sustainability, as will be the now high rankings associated with publications. It however still needs to be noted that sufficiency of funding from internal, government, and other sources remains one of the highest risks with respect to sustaining the outcomes. The observation during the 2022 visits to sites that received infrastructure support is that Mak still faces a major challenge with respect to funding planned maintenance and repair of equipment.

5.5 Overall Recommendations (regarding Sida's general approach to research capacity building)

Change management is an aspect that needs to be emphasised as part of programme design because many of the challenges related to environment and efficiency have behavioural origins. This ranges from the leeway postgraduate faculty take for granted in working according to their own instead of the institutional timetables; bureaucratic cultures that slow down systems, however efficiently designed; and taking maintenance as a peripheral consideration in allocating resources.

Any future programme of this kind of magnitude, or even smaller, should place considerable emphasis on achieving impact at the national level; until this happens, failure to sustain outcomes will always be a major risk. Sustainable change at the institutional levels can only be achieved within the context of changes at the national level, and it is recommended that programmes in Uganda or elsewhere incorporate this as a key element. Research in developing countries will be sustained only if national allocations to research take a lead in funding. As noted, Uganda still spends the least on research as a percentage of GDP within Eastern Africa.

National ownership funding could be achieved by using Sida funding to leverage improvements in the national research environment so that more funding for research from the government is made available. This could incorporate an approach to funding predicated on counterpart funding from the government right from the start (cash rather than the in-kind approach that was used). Such an approach could be structured with Sida funding

starting low during the early phases, where there is major focus on institutional support, then scaling up with the major focus on research and research capacity building and then scaling down as national government funding takes up the load on an increasing basis.

It is true that the national capacity in science is critical to development, but it should also be recognised that the humanities, which more often than not create the context of the development environment, are also an important area to support. Any future programme of this kind of magnitude, or even smaller, should place considerable emphasis on achieving impact at the national level; until this happens, failure to sustain outcomes will always be a major risk.

A planned cultural learning phase is always critical for any collaboration between countries with different institutional cultures or levels of development. Initially, there was insufficient attention given to the need for cultural alignment, but the necessity of this was later better appreciated with supervisors from Uganda and Sweden visiting the universities of their counterparts and getting a better understanding of culture, strengths and limitations.

It would help a great deal, while also building up Mak's collaborative capacity, if Mak were to approach this collaboration with PPU's in the same way Sida approached collaboration with Mak. Should any future support be considered for the PPU's, it should be structured along the lines of strengthening their research capacity with Mak as a key player. This would also demonstrate a cascade effect in research capacity building.

5.6 Conclusions

The overall finding is that the RCP was an ambitious programme that was able to learn from and adapt to the Mak environment in a way that enabled the achievement of the planned outcomes. It is also evident that the research environment has developed to a level where the internal sustainability of outcomes can be achieved. The greatest risk factor remains the low levels of local funding from the government and the university.

The taught PhD programme in mathematics has been successful and appears to be set to change the format of PhD training at Mak and other public universities. The gap that this programme was not structured to significantly inform and transform the research and research training environment in the other public university, however, needs to be recognised and addressed: *this could indeed open the way for a new collaboration with Sida specifically targeting such universities, with Mak as a resource.*

Appendix A: Research Questions

Dimension	Evaluation Question
Relevance	<ul style="list-style-type: none"> • To what extent did the programme respond to Mak's needs and priorities as it works to transition from a teaching to a research-led university? • To what extent did the programme respond to Uganda's development needs and priorities? • To what extent was the programme responsive to the individual research interests of students?
Coherence	<ul style="list-style-type: none"> • To what extent has the programme been compatible with other interventions at Mak in terms of research and PhD training? (internal coherence) • To what extent has the programme been consistent with international norms and standards related to university research and PhD training? (external coherence) • Among the various programme components (or projects), which made the biggest contribution to/impact on research activity at Mak? • Participation of Swedish Universities • Participation of Swedish institutions • Participation in the sandwich PhD programme • Setup of local PhD programme • Institutional support
Effectiveness	<ul style="list-style-type: none"> • To what extent has the programme supported Mak in improving processes related to research? • To what extent has the programme supported Mak in improving processes related to PhD training? • To what extent did the programme achieve its design objectives as envisaged at the very beginning? • To what extent was the programme adaptive/responsive/innovative in dealing with the situation on the ground and challenges encountered? • To what extent has the programme increased research capacity at Mak? • To what extent has the programme increased PhD training capacity at Mak?
Efficiency	<ul style="list-style-type: none"> • To what extent were the programme objectives achieved at the least cost? • To what extent were the programme objectives achieved within the planned timelines?

Dimension	Evaluation Question
	<ul style="list-style-type: none"> • Could better outcomes have been achieved from the research cooperation through the usage of the same resources differently? • How efficient were the management and accountability structures of the programme? • How did the programme financial management processes and procedures affect implementation?
Impact	<ul style="list-style-type: none"> • To what extent has Mak developed the necessary capacity to initiate research projects? • To what extent has Mak developed the necessary capacity to coordinate and support research projects? • To what extent has Mak (or researchers at Mak) established collaborations with regional and international research teams? • To what extent has research been integrated into the strategic direction/planning activities and budgets of Mak? • To what extent has the programme impacted academic quality within local PhD programmes? • To what extent has the research cooperation impacted the research characteristics at Mak (e.g. supervision quality, supervisor commitment, student commitment and completion time)? • How is the PhD training at Mak perceived by staff at the collaborating Ugandan universities? • To what extent has the programme contributed to improved research capacity at the collaborating Ugandan universities? • To what extent has Mak put in place any standing institutional arrangements or processes related to research and PhD training as a result of the programme? • Are there any unintended positive or negative effects of the programme on Mak or individual participants? • To what extent has the programme contributed to creating thematic networks at the national, regional and international levels?
Sustainability	<ul style="list-style-type: none"> • Is there evidence of increased or available funding from Mak, the Uganda government and contracted research to sustain the positive outcomes? What is the trend? • Is there evidence that Mak now has effective institutional arrangements and policies to actively seek to grow the university research budget? What is the trend? • Is there evidence that the time allocation between teaching and research continues to shift to allow more time for the latter? • What is the likelihood of the continuation and sustainability of project outcomes and benefits after completion of the programme?

Dimension	Evaluation Question
	<ul style="list-style-type: none"> • Is there evidence that the terms of employment (sufficiency remuneration with respect to cost of living, funded sabbatical leave, incentives such as a share in IPR, etc.) have shown shifts that motivate staff to give time to research? • To what extent has Mak's research capacity, as well as the capacity of other public universities, been enhanced so as to contribute to Uganda's development needs? • To what extent are gains in research capacity and PhD training derived from the programme likely to continue after the end of the programme? • To what extent is Mak sustaining or increasing investment in physical and soft resources provided through the programme as institutional support (e.g. ICT services and systems, laboratories (e.g. GIS), access to online journal databases)? • What are the recommendations for similar support in future? (The recommendations should provide comprehensive proposals for future interventions based on the current evaluation findings.)
Other	<ul style="list-style-type: none"> • What have been some major challenges encountered during the implementation of the programme? • What are the key lessons that can be drawn from this programme for both Mak and Sida? What are the key success factors? To what extent is there potential for the replication of programme successes across other parts of Africa/the world?

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