LASER PULSE

Long-term Assistance and Services for Research (LASER)
Partners for University-Led Solutions Engine (PULSE)

ASSESSMENT OF THE RESEARCH CONTEXT AND RESEARCH CAPACITY IN HIGHER EDUCATION INSTITUTIONS IN AFRICA

SUPPLEMENT TO AGREEMENT NO. AID-7200AA18CA00009

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List of Abbreviations

CDR	Center for Development Research
HEI	Higher Education Institution
HESN	Higher Education Solutions Network
HIC	Higher Income Country
LASER	Long-Term Assistance and Services for Research
LMIC	Low- and Middle-Income Country
PULSE	Partner University-Led Solutions Engine
RAN	Resilient Africa Network
RMSS	Research Management and Support Systems
STIP	Science, Technology and Innovation Partnership
USAID	United States Agency for International Development

Executive Summary

Background

USAID's Center for Development Research (CDR), through the Higher Education Solutions Network (HESN), awarded the Long-Term Assistance and Services for Research (LASER) – Partner University-Led Solutions Engine (PULSE) initiative to Purdue University. The Mission of LASER is to increase the participation of universities in research that contributes to the improvement of development outcomes. The anticipated outcome of LASER is 'enhanced discovery and application of evidence-based solutions to development challenges'. The LASER-PULSE initiative planned, as one of its core activities, to conduct a capacity assessment of the research environment in partner universities, especially targeting low- and middle-income country institutions. Makerere University, a LASER consortium member, led a capacity assessment to identify barriers to research and its translation in Higher Education Institutions (HEIs) in selected universities in sub-Saharan Africa, with the goal of identifying priority gaps for capacity building.

Methods

The main frameworks that guided the analysis were the modified 'framework to evaluate research capacity building in health care' by Cooke, composed of eight dimensions: 1) Research Infrastructure, 2) Skills and Confidence, 3) Linkages, Partnerships, and Collaboration, 4) Continuity and Sustainability, 5) Leadership, 6) Empowerment, 7) Research Applicability, and 8) Dissemination and Knowledge Translation and the eight sub-elements of the Research Management and Support Systems (RMSS) project's analytical framework (i) Research Strategies and Policies, ii) Institutional Support Services and Infrastructure, iii) Supporting Funding Applications, iv) Project Management and Control, v) Human Resource Management for Research, vi) Human Resource Development for Research, vii) External Promotion of Research, and viii) National Research Engagement. The dimensions and sub-dimensions from these frameworks were translated into a questionnaire. The bulk of the questionnaire items were presented in 0-5 point Likert scales in which the universities scored themselves. Other items were entered as numerical counts (e.g. total enrollment) or percentages.

The assessment targeted a total of 36 universities in sub-Saharan Africa. The study design was a quantitative web-based self-administered university survey. The unit of administration was a university. Focal points who are academic staff in the target universities helped to identify, recommend and contact appropriate persons and offices to coordinate the completion of the questionnaire. Participants received multiple reminders to encourage them to complete the questionnaire on time. Data was analyzed using Stata Version 14. For Likert scale items, the average score for each questionnaire item was determined. Thereafter, the average score for each dimension (or sub-dimension for larger dimensions) was determined and the average scores graded as '0' meaning 'nothing established', '1' meaning 'very weak', 2 meaning 'weak', 3 meaning 'moderate', 4 meaning 'good', and 5 meaning 'very good'.

Results

A total of 27 universities (75% of targeted institutions) from 12 African countries participated. The universities were highly variable in size, ranging from a total enrollment of 372 undergraduate students in the smallest institution to 55,708 in the largest one.

The research capacity area in which universities scored highly was 'national research engagement' (mean score=3.7/5). The research capacity areas in which universities scored moderately were (a) research strategies and policies (mean score=3.3/5), (b) institutional support services and infrastructure (mean score=3.1/5), (c) supporting funding applications (3.4/5), (d) human resource management for research, (e) human resource development for research (3.3/5), promotion of research visibility (3.3/5), and (f) linkages, partnerships, and collaboration (3.1/5).

Regarding 'research policies and guidelines', HEIs scored highly on availability of a research policy and guidelines (85.2% scoring 'good-very good'; mean score 4.5) and on research-outputs-based promotion (mean score=4.2). They scored weakly on availability of policies for commercialization of research (48.1% scoring 'weak-to-very weak'; mean score of 2.5), on incentivizing research (37% of universities scored 'weak-to very weak'; mean score=2.9), and on availability of clear policies to protect intellectual property (mean score=2.9).

Under 'institutional support services and infrastructure', the sub-dimensions of strength were the presence of research coordination offices at top management level (for which 81.4% of universities scored 'good to very good'; mean score=4.1), and presence of a grants management unit (51% of universities scored 'good-to-very good'; mean score=3.0). Areas of weakness included adequacy of research labs (mean score=2.4), data management policies and infrastructure (mean score=2.7), and adequacy of capacity for ethical and scientific review of research (mean score=2.8). While universities' central offices were doing moderately well in providing institutional support services and infrastructure for research, there were substantial capacity gaps at the operational level.

Under 'human resource management and development for research', low scoring sub-dimensions included adequacy of administrative research support staff (44% of institutions had a 'weak-to-none' score; mean score=2.5) and availability of a predictable and sustainable remuneration structure for non-academic technical research staff (40.7% of institutions had a 'weak-to-none' score; mean score 2.9). On 'human resource development for research', universities scored highest on availability of field attachments and field training for students (mean score=4.5), and lowest on availability of post-doctoral training programs (74% of HEIs have a 'weak-to-none' score grade; mean score of 1.6). Other areas of weakness in this capability included presence of a formal induction program for younger researchers (where 48.2% of institutions had a 'weak-to-none' score; mean score; 2.8) and availability of active research training programs at PhD level (where 44.4% of institutions had a 'weak-to-none score'). The development areas with the largest capacity gaps both in terms of distribution of expertise and numbers of available experts were: 1) working in crises and conflict, (2) energy, 3) gender, (4) democracy and governance and 5) water and sanitation.

Regarding 'promotion of research visibility', the sub-dimension with the lowest score was 'whether the research section of the institution's website was up-to-date with on-going research, feed-back and knowledge products' (48.1% of the HEIs had a 'weak-to-none' score; mean score=2.4) consistent with the observation that 'research project management and control' was one of the major capacity gap areas for universities.

Research capacity areas in which universities scored lowest were (a) research project management and control (mean score=2.7/5), (b) continuity and sustainability (mean score=2.8/5), (c) empowerment (2.9/5) and (d) leadership (2.6/5), and (e) dissemination, knowledge translation, and research applicability (2.6/5). Factors that contributed most to the low score in the dimension of research project management and control were: the lack of information management systems to track research projects (55.6% of universities scored below moderate while six universities (22.2%) had no such systems in place (mean score=2.2) and the lack of project management training to staff (40.7% of universities scored a 'weak-to-none' grading, with a mean score=2.7).

The dimension 'continuity and sustainability' scored low in the areas of inadequate funding for research support offices by universities (40.7% of HEIs returned a 'weak or very weak score', mean score=2.7), and availability of internal funding for research (48.1% of HEIs returned a 'none-weak' score, mean score=2.6). Seventy-one percent of funding for research in study HEIs comes from donors. Governments provide only 9.7% of funding. Seven and a half percent of funding comes from local institutional funds within HEIs and 7.9% from consultancies.

In the area of linkages, partnerships and collaborations, areas of weakness included 'access to HEI research collaborators from high income country universities' (mean score=2.9) and 'linkages with national and sector ministries and involvement in their technical working groups'. It is worth noting

that HEIs in Africa seem to have a relatively strong foundation in community linkages. On the sub-capability 'the institution has a strong linkage and presence as an implementer in the communities with community research or intervention sites', 79.4% of institutions had a grade score of 'moderate-to-very good' and 51.8% scored 'good-to-very good'.

Under empowerment, low scoring sub-components included support to junior faculty, and empowerment for female researchers. Two thirds (66.7%) of HEIs scored 'weak-to-none' regarding availability of incentives for female researchers while one-in-six institutions (18.5%) had no incentives at all. Only 19.8% of research projects were headed by female researchers. Only 48.2% of HEIs had an academic unit responsible for women and gender studies. One-in-five universities (22.2%) have an undergraduate female enrollment that is less than 30% while one-in-two universities (51.8%) have a graduate female enrolment that is less than 30%. Only two universities (7.4%) have over 50% female graduate enrollment. Sixty-three percent of HEIs have a PhD female enrollment of less than 30%. One-in-two universities (48.2%) have a percentage of female faculty that is less than 30%. Seventy percent of universities have a PhD-level staff of less than 30% female. The average number of male staff with PhDs is 146, while that for females is 49, leading to a sex ratio of 2.5:1. Gaps in empowerment were also observed in the empowerment of academic units with low research outputs as earlier indicated in the section on institutional support mechanisms for research.

The lowest scoring area under the leadership dimension was the availability of training courses that target cross-cutting non-technical skills important for the management of research projects including research leadership, internal communication, and research project management.

Regarding dissemination, knowledge translation, and research applicability, all the key areas of assessment scored low including: availability of translation expertise (mean score=1.9), credibility with the private sector (mean score=2.4), availability of translation support units (mean score=2.5), and translation linkages with government sectors (mean score=2.4). In general, only 20.2% of research outputs on average, from faculty and student researchers, were translated into knowledge products other than journal articles and disseminated to stakeholders over a reference period of three years. In addition, only 15.6% of research outputs on average are reported to have resulted into discernible policy and program impact over a 5-year reference period.

Regarding research portfolios, the publication output of HEIs was moderate; 29.6% of HEIs had at least 200 peer-reviewed publications while close to one half (48.1%) had 50 or more publications. The total publication output from all 27 institutions was 6,390, with a range of 0 publications to 2,154. The academic units reported to have the largest volume of research and innovations are (1) Health and Medical Sciences, (2) Engineering and Technology, and (3) Agriculture. Academic units reported to have the lowest volume of research and innovations were (1) Social Sciences, Arts and Humanities, (2) Education, and (3) Law.

This assessment shows that HEIs in Africa have capacity gaps in all 13 capabilities assessed. In general, the capability in which universities showed the highest capacity score was: 'national research engagement'. Research leadership, research dissemination and translation, empowerment, sustainability, and lower level institutional support services were the lowest scoring areas. These five are the priority areas that should be targeted for capacity enhancement of the research ecosystem in African HEIs, as universities are a key component of the national research ecosystems in the region. The research questions filled by this report align with the objective of LASER, which include building the capacity of HEIs' research ecosystems. These findings therefore have important implications for LASER's capacity-building strategy as they indicate the critical gaps that universities and national governments need to fill in order to build a vibrant research ecosystem in universities and in the countries.

1.0 Background

1.1 About LASER-PULSE

USAID's Centre for Development Research (CDR), through the Higher Education Solutions Network (HESN) awarded the Long-Term Assistance and Services for Research (LASER) – Partner University-Led Solutions Engine (PULSE) initiative to Purdue University. The Mission of LASER is to increase the participation of universities in research that contributes to the improvement of development outcomes. LASER-PULSE's core partners are Purdue University, Catholic Relief Services, Indiana University, the University of Notre Dame in the US, and Makerere University in Uganda. The anticipated outcome of LASER is 'enhanced discovery and application of evidence-based solutions to development challenges'. This is to be achieved under four key intermediate results: (I) Increased Higher Education Institution (HEI) delivery of collaborative and effective development focused research; (II) Increased HEI synthesis, exchange, and translation of research results into useable development products and practices; (III) Increased dissemination and use of translated research solutions and policy; and (IV) Enhanced systems and structures for gender considerations in the HEI network that enable women and minorities to lead and benefit from research.

LASER aims to mobilize a network of researchers from HEIs from both high-income countries (HICs) and low- and middle-income countries (LMICs) to conduct research that responds to development priorities, generating knowledge products that impact on development by increasing the effectiveness of development interventions. Researchers in the network will participate in responding to a research agenda identified by the network, in collaboration with development practitioners, by submitting research proposals in response to specifically targeted grant calls. An active process of solicitation and enrollment into the LASER network of researchers with the skills and experience to conduct quality research in key development areas of focus for CDR and the Science, Technology and Innovation Partnership (STIP) will increase the pool of researchers that can be readily contacted by USAID Missions, Bureaus and Operating Units whenever critical programming and policy issues that need research evidence arise. In order for the grant calls to get adequate responses from low- and middle-income universities, and in order for the resulting research to have maximal impact on development outcomes, there is a need for the university research ecosystems in developing countries to be adequately responsive to such research initiatives and ready to support researchers by providing a conducive research environment. University research ecosystems have a profound effect on the readiness of universities to conduct high quality development research that meets the needs of development practitioners.

1.2 University research capacity assessment

Research ecosystems in universities in low-income countries like those in Africa face many challenges. These challenges translate into a much lower level of research outputs from low-income country universities compared to developed countries (Duermeijer, 2018, Gonzalez-Brambila and Perez-Angón, 2016, Ngongalah et al., 2018). The challenge of research translation is also pervasive (Gonzalez-Brambila and Perez-Angón, 2016, Waruru, 2017). Not only is there inadequate data and tools to inform development decisions among development practitioners and funders in LMICs, but involvement of LMIC universities in generating this data is low compared to the level of need for such evidence. Furthermore, many research products are not adequately translated and disseminated to end-users, policy makers and development partners. Despite these shortfalls, LMIC universities are strategically placed to address the information and data needs to inform development in their countries and localities given that they have large pools of experienced scholars in proximity to the target communities, a better understanding of the local context and development issues, and strong linkages with government entities. These universities are easily accessible to support USAID in solving pressing development challenges through research. In order to increase development research outputs from LMIC universities, there is need to build research capacity for the universities. This requires the identification of key capacity strengths and gaps in these

ecosystems. Identification of capacity gaps would facilitate the design of specific mechanisms to fill some of these gaps.

As one of its core activities, the LASER-PULSE initiative conducts a capacity assessment of the research environment in partner universities, especially targeting low- and middle-income country institutions. Makerere University led a needs assessment to identify barriers to research and its translation in HEIs in selected universities in sub-Saharan Africa. This assessment was initially carried out among the Makerere University-ResilientAfrica Network (RAN) university partners and affiliated networks/ institutions in sub-Saharan Africa. The survey answered questions such as:

i. What systems and infrastructure exist to encourage and support research in addition to teaching?
ii. What incentives or barriers exist to disseminate and/or commercialize research?
iii. Characterize the research relationship between the government and the HEI? Private sector and HEI. Are HEIs seen as legitimate sources of evidence upon which to base government policies? Of innovation for private sector?
iv. What are incentives for junior faculty? When and how does tenure occur?
v. At what point in academic careers are faculty allowed to supervise graduate students as research assistants? Do research assistantships exist? If not, what are the barriers/challenges?
vi. Do faculty participate in development research? In what ways? How do they make these contacts?
vii. Do faculty provide data and other research products as inputs to the national development policies?
viii. Are any special provisions made to incentivize female researchers? Are there any conditions that discourage female faculty from the research enterprise?

The findings from this assessment will be used to identify, prioritize, and describe key capacity gaps that need to be addressed in order to increase development research outputs and impacts from low-income country universities. The gaps identified will then inform the design of institutional capacity-strengthening activities for researchers, university officials at the individual HEIs, and institutional network secretariats, so that the activities are targeted to areas of highest need. Capacity strengthening activities arising from this assessment could include thematic workshops targeting research leaders at the Research for Development workshops that LASER-PULSE will conduct on a bi-annual basis, short courses, and other mentorship activities.

2.0 Literature review

Research constitutes a fundamental function for higher education institutions. Not only does it service their academic and education credentials, but it also comprises a major revenue stream (Bates et al., 2011, Jessani et al., 2014, Van Rensburg et al., 2017, Wallis et al., 2017). From a sector-wide and global perspective, the importance of research and experimental development can be elucidated from the fact that increased investment in research and development has been prioritized in several global development strategies including the Sustainable Development Goals (Nations, 2018, Union, 2018).

The 1990 Commission on Health Research for Development cited strengthening research capacity as "one of the most powerful, cost-effective, and sustainable means of advancing health and development" (Franzen et al., 2017). However, while the demand for evidence-based knowledge has led to increased global spending on research and development, with a recorded expenditure of almost US$1.7 trillion in 2013, huge disparities still exist between investments in LMICs compared to their HIC counterparts, where 10 countries account for 80% of this global spending (Statistics, 2018). Recognizing these disparities which have existed for decades, the first African Ministerial Conference on Science and Technology in 2003 solicited participating countries to commit to

spending at least 1% of their GDP on research and development by 2010 (Wallis et al., 2017). Only Kenya, Malawi, and South Africa have managed to get within range of this target. In the meantime, Kenya, Mozambique, Senegal and Uganda all have more than 40% of their research and development portfolio financed from funding agencies based in HICs (Wallis et al., 2017, Belizán et al., 2017, Franzen et al., 2017). As a result of this research financing set-up, research agendas are often set by international funders, with research firms in HICs being recruited to lead research projects in LMICs. In such cases, LMIC researchers often play peripheral support roles, contributing minimally to the design, data management, and analysis of these studies (Belizán et al., 2017).

As part of this problem, retention of trained researchers in LMICs is a challenge. It is reported that the majority of countries in sub-Saharan Africa have less than 500 researchers (of all disciplines) per million inhabitants (e.g. Tanzania 35, Ghana 39, Malawi 50, and Senegal 361) compared with 4,000 per million inhabitants in the UK and North America (Statistics, 2018, Wallis et al., 2017).

There are numerous other disincentives to pursuing a research career in many African countries including heavy teaching loads, weak organizational research systems, lack of national research leadership, lack of sustained funding from government or private sector, limited graduate programs in universities, limited access to scientific information, slow internet connections, and inadequate physical facilities including libraries and laboratories among others (Wallis et al., 2017). These factors interplay to cause a shortfall in institutional capacity for research on the continent. Institutional capacity for research in universities and research institutions is defined and reflected in the ability to mobilize and allocate resources, assess research, recruit and train researchers, and supply laboratories, libraries, internet services and other important infrastructure (SIDA Definition).

Despite these challenges and shortfalls, there have been various efforts to boost institutional capacity for research on the continent (Bates et al., 2011, Franzen et al., 2017). The range of activities include grants writing and implementation, research training at the undergraduate, masters and PhD level, short courses for policy makers to enable them to demand for and scrutinize research, establishment of research support offices, centers of excellence and research networks that work to build the capacity and facilitate sharing of expertise among local researchers, collaborative development of research agendas between various stakeholders, and establishment of internal research support funds (Bates et al., 2011, Franzen et al., 2017). However, the extent of the distribution of these developments and the research capacity in different African universities has not been assessed. The capacity of African universities in different areas related to research has not been quantified. Without such an assessment, it is unknown which capacity gaps need to be prioritized to increase development research capacity for LMIC universities.

3.0 Scope of the capacity assessment

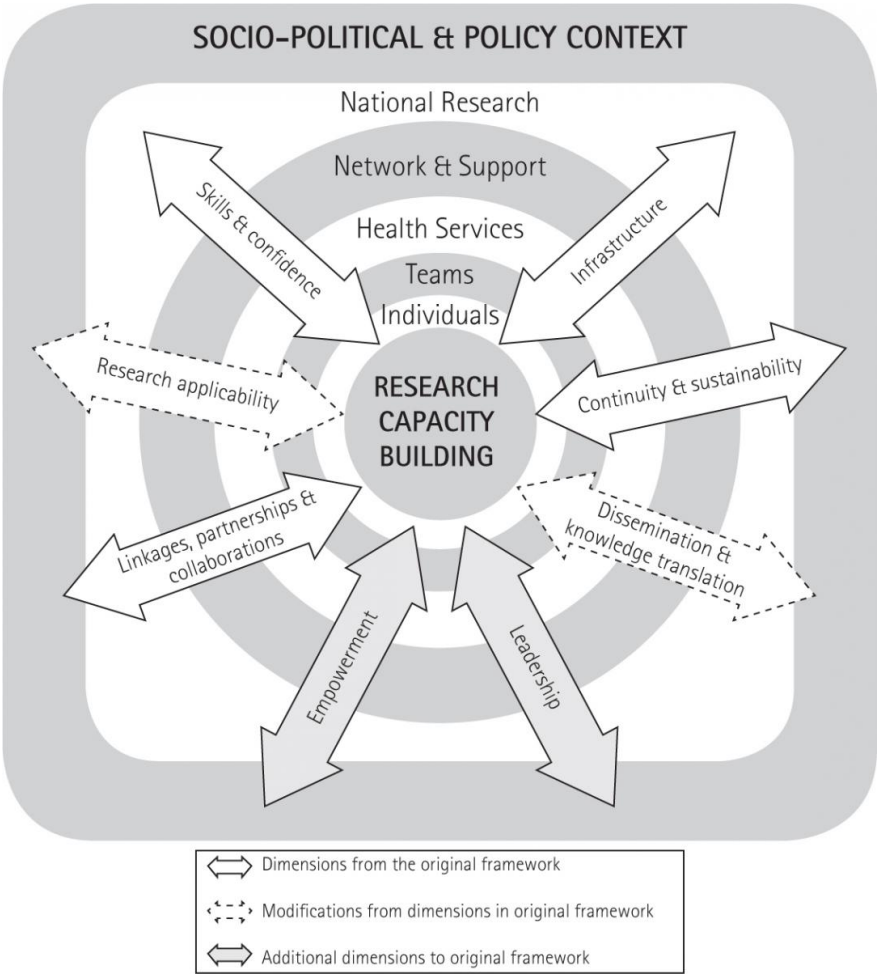
LASER's research capacity assessment has initially targeted institutions of higher learning in sub-Saharan Africa, focusing on institutions covered by the already existing RAN (one of the LASER/PULSE partners) and its affiliated institutions. The evaluation focused on systems for supporting research in the target institutions as well as the availability of demonstrable intermediate outputs like research agendas and research skills training courses. The capacity assessment took the perspective of a central level assessment, meaning that the respondents were at the top management level within the university rather than in the individual academic units.

3.1 Guiding frameworks for the evaluation

There is a dearth of capacity assessment frameworks and tools that have been tested and applied to assess research capacity in African university settings (Jessani et al., 2014).The approach to this study was guided by two frameworks for research capacity assessment that have been used in past studies, including in African HEIs. The main framework that guided the analysis was a modified version of the 'framework to evaluate research capacity building in health care' (Cooke), modified by Rensburg and colleagues (Van Rensburg et al., 2017). It prescribes eight constructs that need to be discerned in a research capacity assessment for HEIs: 1) research infrastructure, 2) skills and confidence 3) linkages,

partnerships and collaboration, 4) continuity and sustainability, 5) leadership, 6) empowerment, 7) research applicability, and 8) dissemination and knowledge translation. The framework is presented in the figure below:

Figure 1: The modified Cooke Framework for University Research Capacity Assessment



In addition to the Cooke Framework, the eight key elements used in the Research Management and Support Systems (RMSS) project's analytical framework for research capacity in universities were amalgamated as sub-elements of the 'Research Infrastructure' component of the Cooke Framework. The RMSS Framework was used by the Liverpool School of Tropical Medicine in its research capacity building program for universities in Ghana, Malawi, Senegal, and Tanzania between 2014 and 2016 (Cooke). The eight sub-elements are: i) research strategies and policies, ii) institutional support services and infrastructure, iii) supporting funding applications, iv) project management and control, v) human resource management for research, vi) human resource development for research, vii) external promotion of research, and viii) national research engagement (Van Rensburg et al., 2017).

3.2 Description of the dimensions and sub-dimensions assessed

Based on these two frameworks, a brief description of the items included in the capacity assessment tool is provided below:

1. Research infrastructure

Research Strategies and Policies: This sub-dimension under 'research infrastructure' assessed the existence of a research policy in participating HEIs, guidelines to support implementation of the policy, and the extent to which the policy and guidelines were implemented at lower levels. It also assessed presence of an institutional research agenda and whether the process of setting the research agenda was consultative both within and outside of the university. It looked at presence and effectiveness of incentive structures for encouraging research in the HEI setting. It also assessed

availability of policies and frameworks for the commercialization of research and protection of intellectual property, and whether these policies and frameworks were operational.

Institutional Support Services and Infrastructure for Research: This sub-dimension looks at the presence of research support offices and services for researchers in the institution. It assesses the presence of grants management offices at different levels. It assesses the presence of a functional relationship between these research support offices at the top management level and the lower academic units within the HEIs. It assesses the extent to which the semi-autonomous lower academic units have also established research support infrastructure at their level. The presence of research laboratories that can support specialized research in all key disciplines and whether they are adequately equipped to do so is also assessed. This sub-dimension also assesses the presence and capacity of libraries to support research. It assesses the presence of other critical research support infrastructure including accessibility to internet, access to journals and e-resources, and access to ethical and scientific review boards.

Supporting Funding Applications: This sub-dimension assesses the extent to which the institutions provide support to researcher teams that are submitting research grant applications.

Project Management and Control: This sub-dimension assesses the presence and integrity of the mechanisms to manage research projects in the institution and whether the institution is able to keep track of multiple concurrent research projects. This includes tracking contracts and agreements, research protocols, budgets, compliance with funding requirements and accountability, reports and deliverables, overheads, formal approval, and continuous review. It also looks at the capacity to track project implementation, project spending and accountability, and mitigation of research related risks.

Human Resource Management for Research: This sub-dimension assesses whether research administrative staff are included in the institution's human resource structure and whether researchers receive training in financial management. It assesses whether research positions are protected and have clear career structures and whether their remuneration structure is adequate and consistent. The sub-dimension also assesses whether the institution's academic staff have flexible contracts that allow them adequate time to conduct research in addition to their academic activities. Additionally, it assesses presence of senior research degree training.

Human Resource Development for Research: This sub-dimension assesses provisions available for human resource development for research including availability of core research training courses, training in non-research skills that enhance research, and current enrollment levels into PhD programs under the different technical areas of importance to development.

External Promotion of Research: This sub-dimension assesses the existence of programs for promoting visibility of research conducted within the institution, availability of opportunities for research communication training, and availability of field placement opportunities for students.

National Research Engagement: This sub-dimension assesses whether the institution engages with policy makers at the national and subnational levels for research uptake. It also assesses linkages between university research environment and the national research policy.

2. Continuity and sustainability

This dimension focuses on the sustainability of the institution's research infrastructure and activities. Particularly, it assesses the adequacy of funding for research as well as the different sources of funds. It also assesses the extent to which universities contribute to research funding through their internal budget and resources, and the balance between local research funding compared to reliance on donor funds.

3. Linkages, partnerships and collaborations

This dimension looks at the existence of strategic linkages and partnerships for research. It assesses the extent of partnerships with the private sector and development agencies. It also assesses the presence of linkages with communities, linkages between academic units and their sector ministries at the national level, and linkages between local researchers and international researchers from HEIs in developed countries.

4. Empowerment

The sub-dimension on empowerment assesses the level of involvement of junior researchers, female researchers, and other groups that tend to be marginalized (especially young researchers) and the existence of incentives to promote female researchers and junior faculty members to increase their capacity and opportunities for engagement in research.

5. Leadership

This dimension assesses whether leadership, a cross-cutting skills area necessary for promoting change and innovation, is made available to researchers as a means of promoting the institutionalization of good practices in improving the institution's research outputs (both quality and quantity). It also assesses the extent to which academic departments with low capacity for research are supported to increase their research outputs.

6. Dissemination, knowledge translation and research applicability

This dimension assesses the extent to which the institution has capacity to translate research findings into policy and program impacts. This includes the presence of knowledge translation units, presence of capacity building activities in knowledge translation, and presence of knowledge management relationships with government entities and the private sector. In line with this, it assesses the extent to which the institution's research agendas are developed in consultation with development practitioners and policy makers. It estimates the extent to which research outputs result into policy and program changes.

7. Research portfolio

This dimension estimates the total research output from the institution and disaggregates the research outputs by key sectors pertinent to development.

3.2 Approach to data collection

3.2.1 Study sites/institutions

The assessment targeted a total of 36 universities in sub-Saharan Africa. These included all of the institutions in the current RAN (20 universities) as well as eight universities in the extended network that includes other university networks in Africa with which the RAN and Makerere University are connected. In addition, the assessment targeted an additional eight other universities from Uganda, as part of an initiative towards the creation of a local university sub-network of researchers from local universities in Uganda and in line with the aspiration of the USAID/Uganda Mission.

3.2.2 Study design

The design of the study was a quantitative survey. The survey dimensions and sub-dimensions from the reference framework were translated into a questionnaire. The unit of assessment was 'a higher education institution' and the level of assessment was the central administration of the university. For effective reach over a wide geographical area, the questionnaire was adapted to a web-based

questionnaire and delivered as an online survey. The online survey tool allowed respondents to fill in the required information in multiple sessions while saving their entries. This enabled the participants to consult and search for the information when needed and fill it out as they obtained it.

The dimensions and items within the questionnaire were identified from Cooke Framework and the RMSS assessment tool, as well as other items discussed by the technical teams in Makerere and Purdue universities based on their experiences as research institutions. The bulk of the

questionnaire items were presented in the form of Likert Scales in which the universities scored themselves based on a reference scoresheet. This enabled the research team to make quantitative comparisons of research capacity across institutions. The Likert scale scores ranged from 0 to 5. These were specifically interpreted as follows:

- 0 meant that 'there was nothing established in the institution with regard to this capability'
- 1 meant about 1-20% established
- 2 meant about 21-40% established
- 3 meant about 41-60% established
- 4 meant about 61-80% established
- 5 meant about 81-100% established

Responses to some survey items involved entry of numerical counts (e.g. number of students) while others involved entry of percentages (e.g. percentage of funding by type of funder). The questionnaire also contained a few open-ended questions to enable qualitative description of enabling and supporting factors for key capacity dimensions. The internal validity of the assessment tool was strengthened by consulting different stakeholders in university research capacity within the LASER-Purdue network so as to peer review the questionnaire items.

3.2.3 Data collection procedures

The assessment was delivered as a self-administered questionnaire. The unit of administration was a university. Each of the target institutions were contacted to seek their consent and participation in the study. In each of the target institutions, RAN identified two focal points for entry into the institution. The focal points were consulted on who was best suited to fill out the questionnaire at the institutional level. They were then requested to engage with the identified resource person. The questionnaire was adapted to a web-based format, allowing respondents to post their responses online. The system allowed respondents to save partial entries so that they could consult with others for more information on items that needed sourcing from different units within the university. The respondents were sent multiple reminders to encourage them to complete the questionnaire on time.

3.2.4 Data analysis

Data was downloaded from the web portal and exported to Stata Version 14 for analysis after cleaning. For Likert score items, the average score for each questionnaire item was determined. Thereafter, the average score for each dimension or for each sub-dimension (for dimension 1 which had multiple sub-dimensions) was determined. Because the scale for such items was 0-5, the average scores were expected to lie within this range. Based on the specifications given to the respondents in the questionnaire, the average scores were graded as follows:

- 0 meaning 'nothing established'
- 1 meaning 'very weak'
- 2 meaning 'weak'
- 3 meaning 'moderate'
- 4 meaning 'good'
- 5 meaning 'very good'

For each dimension, it was possible to identify the sub-dimensions that were the weakest as well as those that were stronger. Frequencies and percentages were computed for items that involved percentages. Likewise, for items entered as numerical counts, means and range were determined. These items were also converted into meaningful categories and frequencies and percentages computed for the categorized options. The internal consistency of the tools' dimensions and sub-dimensions was tested using reliability coefficients.

4.0 Key findings

Response rate

A total of 36 universities were contacted. Of those that were contacted, 27 universities responded to the survey within the stipulated time, leading to a response rate of 75%.

Background characteristics of participating universities

A total of 12 countries were involved in the analysis as presented in the table below, which also shows the distribution of institutions per participating country.

Table 1: Participating countries and number of HEIs

Country	No	%
DRC	1	3.70
Ethiopia	3	11.11
Ghana	1	3.70
Kenya	3	11.11
Malawi	1	3.70
Mali	1	3.70
Rwanda	1	3.70
Somalia	1	3.70
South Africa	2	7.41
Tanzania	1	3.70
Uganda	11	40.74
Zimbabwe	1	3.7
Total	27	100.00

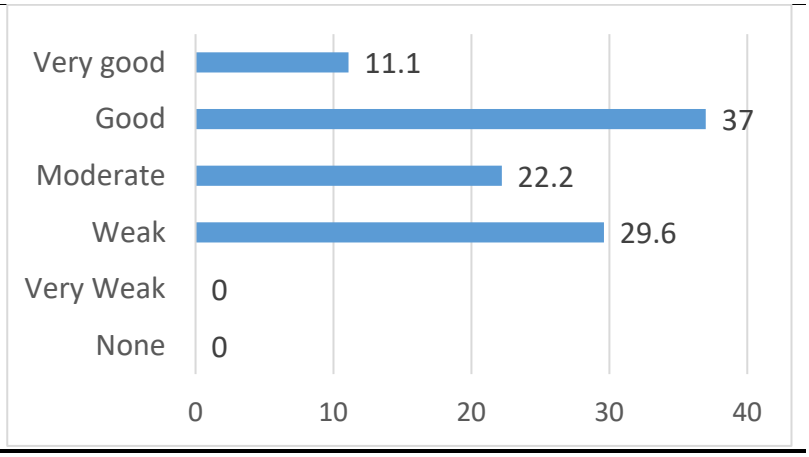
A total of 27 universities were involved in the study. All regions of Africa were represented (Eastern Africa (16 HEIs), Central Africa (1 HEI), Southern Africa (4 HEIs), West Africa (2 HEIs), and Horn of Africa (4 HEIs). The universities involved were of varying sizes. For example, they ranged from 2 to 38 academic units (semi-autonomous faculties, schools or colleges) with an average of 10 academic units. Six of the universities (22.2%) were private not-for-profit institutions, while 21 (77.8) were public institutions.

- Total enrollment of undergraduate students ranged from 372 students in the smallest institution to 55,708 in the largest one.
- Total enrollment of masters' students ranged from none (2/27 universities, [7.4%]) to over 15,000 students (2/27 universities).
- Total enrollment for PhD students ranged from none (7/27 universities, [25.9%]) to over 1,000 (2 universities, [7.4%]).
- The total number of academic staff ranged from 38 in the smallest institution to 3,024 in the largest one.
- The total number of faculty with the expertise to be independent researchers (i.e. academic staff with a PhD level or equivalent qualification) ranged from only four in the smallest university to 1,397 in the largest one.

Research infrastructure: Research strategies and policies

Figure 2: Distribution of capacity score grades for research strategies and policies among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	0	0.0
Weak	8	29.6
Moderate	6	22.2
Good	10	37.0
Very good	3	11.1
Total	27	100.0
Overall Mean Score	**3.3**	**Moderate**



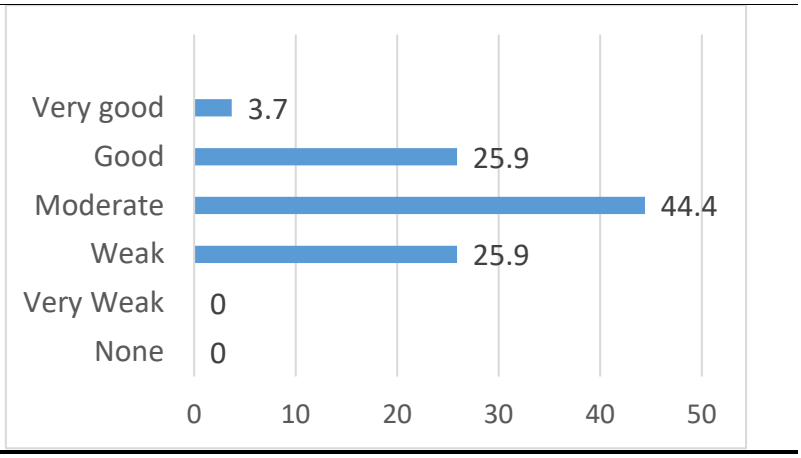
The mean score for this dimension was 3.3, representing a 'moderate' status. About 30% universities had a weak average score on this dimension, while 48% had a good to very good score. None of the universities were in the categories of 'none' or 'very weak'. In this dimension:

- The HEIs assessed scored highly on the availability of a research policy and guidelines (85.2% scoring 'good-very good'; mean score of 4.5) and on availability of research-outputs-based promotion (mean score of 4.2). Institutions scored moderately on presence of up-to-date research agendas that are developed in consultation with all key stakeholders (48.1% scoring 'good to very good'; mean score of 3.3).
- They scored weakly on the presence of policies for the commercialization of research (48.1% scoring 'weak to very weak'; mean score of 2.5), giving as much attention to research in terms of incentives as is given to teaching (about 37% of universities scored 'weak to very weak'; mean score of 2.9), and presence of clear policies to protect intellectual property (mean score of 2.9).

Research infrastructure: Institutional support services and infrastructure

Figure 3: Distribution of score grades for institutional support services and infrastructure among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	0	0.0
Weak	7	25.9
Moderate	12	44.4
Good	7	25.9
Very good	1	3.7
Total	27	100.0
Overall Mean Score	**3.1**	**Moderate**



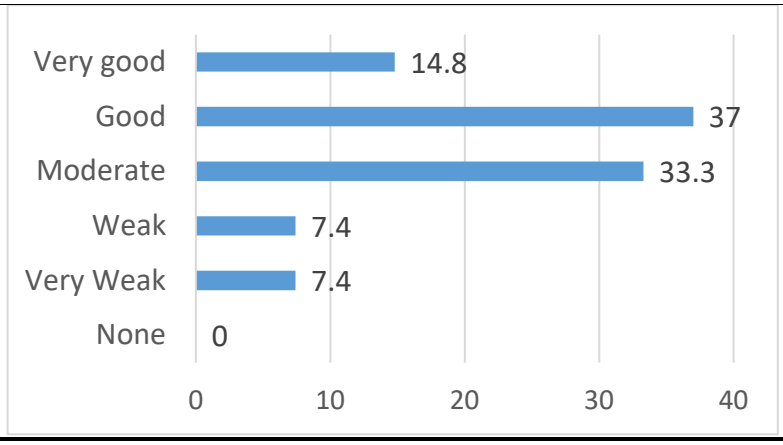
The average score for this dimension was 3.1 representing a 'moderate' status for the participating HEIs in Africa. Close to 30% of universities scored 'good-very good' in this dimension, while none of the universities were in the categories graded as 'none' or 'very weak'.

- The sub-dimensions of strength included the presence of a research coordination office at top management level, for which 81.4% of universities scored 'good to very good' (mean score of 4.1), and presence of a grants management unit (51% of universities scored 'good to very good' (mean score of 3.0).
- Areas of weakness included availability of adequate numbers of well-equipped labs for all key development related disciplines (mean score of 2.4), data management policies and infrastructure (mean score of 2.7), and presence of adequate capacity for ethical and scientific review of research (mean score of 2.8).
- While the central level was doing moderately well in terms of institutional support services and infrastructure for research, there were substantial capacity gaps at the operational level (the academic units) and this was one of the weaker areas of capacity. Although academic units are supposed to be semi-autonomous, eight universities (29.6%) had no individual academic unit with a research support office while two-thirds of universities (66.7%) had less than 50% of their autonomous academic units with a research support office. Even more pressing, at least 13 universities (48.2) had no autonomous academic units with a grants support unit, while about four in five universities (81.5%) had less than 50% of their autonomous academic units with a grants management support office. Other sub-dimensions of relative weakness that mainly affected the operational levels included international accreditation of basic research labs (81.2% of universities did not have accredited labs), and sufficiency of research labs, adequacy of IRBs, and data sharing policies (44.4% of universities scored 'weak to very weak').

Research infrastructure: Supporting funding applications

Figure 4: Distribution of capacity score grades for support to research funding applications among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	2	7.4
Weak	2	7.4
Moderate	9	33.3
Good	10	37.0
Very good	4	14.8
Total	27	100.0
Overall Mean Score	**3.4**	**Moderate**

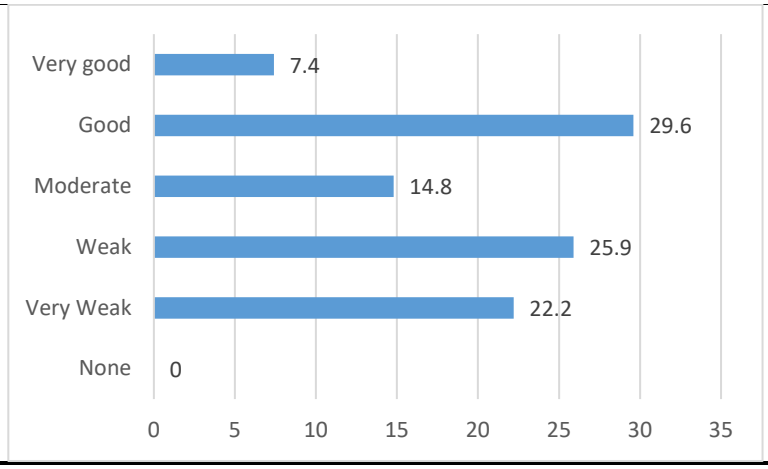


Regarding capacity to support to grant applications, universities scored an average of 3.4, representing a 'moderate' status.

Research infrastructure: Research project management and control

Figure 5: Distribution of capacity score grades for research project management and control among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	6	22.2
Weak	7	25.9
Moderate	4	14.8
Good	8	29.6
Very good	2	7.4
Total	27	100.0
Overall Mean Score	**2.7**	**Weak-to-Moderate**

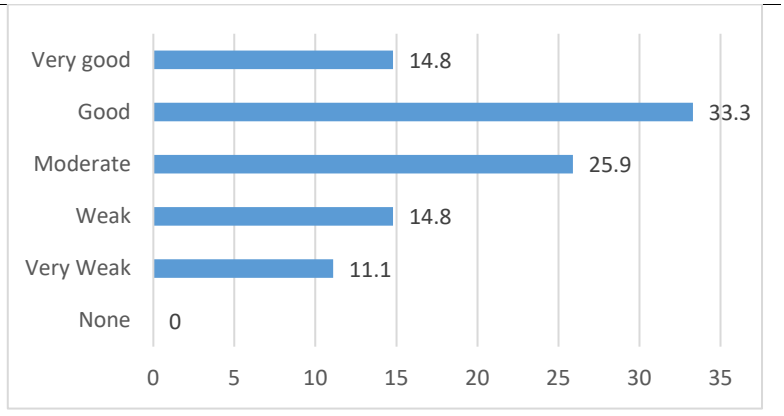


Research project management support was one of the areas where universities scored low on average, with a mean score of 2.7 (representing a 'weak to none' grading). The main contributors to the low score were the lack of information management systems to track research projects in the institutions and to show which research is actively going on where; 55.6% of universities scored below moderate while six universities (22.2%) had no such system at all. The mean score for this sub-dimension was 2.2. The second key contributor to this low score was the extent to which universities provided research project management training to staff; 40.7% of universities scored a 'weak to none' grading, with a mean score of 2.7.

Research infrastructure: Human resource management for research

Figure 6: Distribution of capacity score grades for human resource management for research among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	3	11.1
Weak	4	14.8
Moderate	7	25.9
Good	9	33.3
Very good	4	14.8
Total	27	100.0
Overall Mean Score	**3.3**	**Moderate**

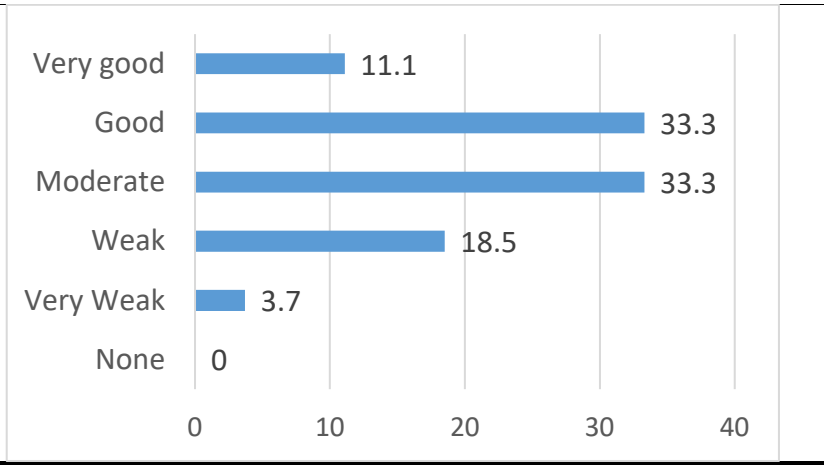


Human resource management for research scored an average of 3.3, representing a 'moderate' status for the study's HEIs. The lower scoring sub-dimensions included the availability of adequate administrative staff to support research (44% of institutions had a 'weak to none' score; mean score of 2.5) and availability of a predictable and sustainable remuneration structure for technical research staff such as research fellows (40.7% of institutions had a 'weak-to-none' score; mean score of 2.9).

Research infrastructure: Human resource development for research

Figure 7: Distribution of capacity score grades for human resource development for research among HEIs in Africa

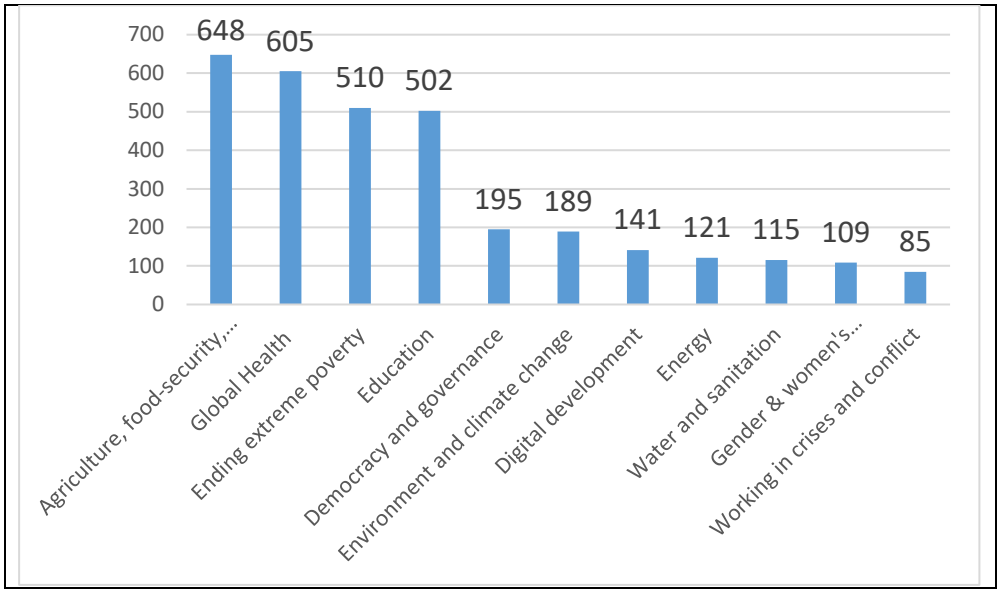
Score Grade	No	%
None	0	0.0
Very Weak	1	3.7
Weak	5	18.5
Moderate	9	33.3
Good	9	33.3
Very good	3	11.1
Total	27	100.0
Overall Mean Score	**3.3**	**Moderate**



This capability had a 'moderate' score, with an average score of 3.3. Universities scored highest on the availability of field attachments and field training for undergraduate students (mean score of 4.5) and for graduate students (mean score of .4). The sub-capability with the lowest score was the availability of post-doctoral training programs where 74% of HEIs have a 'weak-to-none' score grade (with a very low mean score of 1.6). Other areas of weakness in this capability included the presence of a formal induction program for younger researches (where 48.2% of institutions had a 'weak-to-none' score; mean score of 2.8) and availability of active research training programs at the PhD level; 44.4% of institutions had a 'weak-to-none' score (mean score of 3.0), with at least one-quarter of universities not having any PhD level training.

Regarding specific areas of development research capacity, an assessment was conducted on the distribution of available expertise with regard to core development areas stipulated by USAID's LAB-CDR and STIP. First, an analysis was conducted on the overall number of PhD-\ level experts in HEIs in the region. The figure below shows the distribution of PhD level staff by numbers in the key development research areas:

Figure 8: Distribution of the total numbers of PhD level staff by development research from 27 HEIs in Africa



The figure shows that in terms of the overall numbers of experts, the development research areas with the lowest number of PhD level researchers in Africa (based on the sample of institutions assessed) were: 1) working in crises and conflict, 2) gender and women's empowerment, 3) water and sanitation, and 4) energy.

In addition to the aforementioned analysis, additional analysis was conducted on the availability of the different areas of expertise in the universities assessed. The findings are summarized as follows:

Table 2: Distribution of availability of expertise in the core development research areas among HEIs in Africa

Development area	% of HEI institutions **WITH** a PhD level faculty member in this development area
Education	88.9
Digital development	88.9
Agriculture, food-security, nutrition	85.2
Environment and climate change	78.8
Water and sanitation	74.1
Global health	70.4
Gender & women's empowerment	70.4
Democracy and governance	66.7
Working in crises and conflict	59.3
Energy	55.6
Ending extreme poverty	55.6

These findings should be interpreted with a caveat that it is not expected that all universities should have the capacity to conduct training and research in all disciplines. Many universities, especially the smaller universities are only able to cover a few disciplines. However, this analysis is meant to triangulate the earlier analysis to illustrate the development areas that universities tend to prioritize in setting up training programs and the overall gaps in terms of the available capacity to conduct research in the different priority areas of development. The findings show that the four development areas for which advanced level research expertise is least widely distributed among HEIs are: (1) ending extreme poverty, (2) energy, (3) working in crises and conflict, and (4) democracy and governance. The three areas for which research expertise is most widely available in HEIs in Africa are" (1) digital development, (2) education, and (3) agriculture, food-security and nutrition.

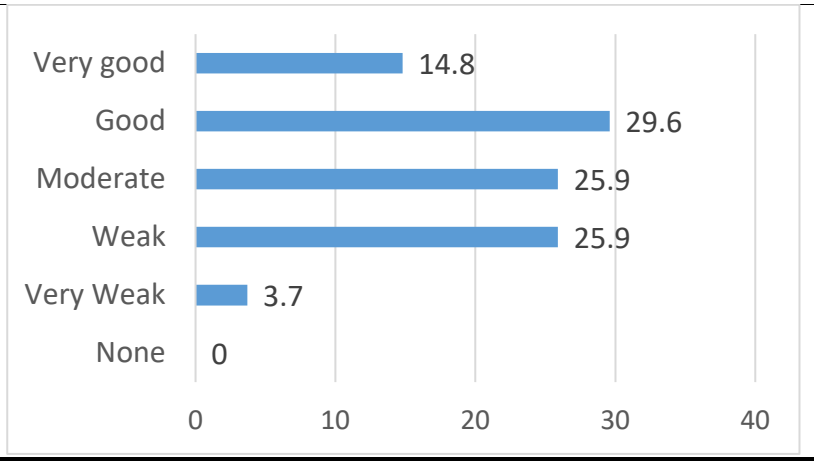
It should be noted that while digital development scores highly in-terms of its availability as a research discipline in the majority of universities, the overall number of PhD level experts in this specialty area is still low as per the previous analysis. On the other hand, while expertise in 'ending extreme poverty' was not widely distributed in HEIs, this area of expertise had the third highest number of PhD level experts, meaning that the experts were available but tended to be clustered in just some universities.

Combining the two analyses above (Figure 8 and Table 2), the development areas with the largest capacity gaps both in terms of distribution of expertise and numbers of experts were: 1) working in crises and conflict, (2) energy, 3) gender and women's empowerment, (4) democracy and governance, and 5) water and sanitation.

Research infrastructure: Promotion of research visibility

Figure 9: Distribution of capacity score grades for research visibility among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	1	3.7
Weak	7	25.9
Moderate	7	25.9
Good	8	29.6
Very good	4	14.8
Total	27	100.0
Overall Mean Score	**3.3**	**Moderate**

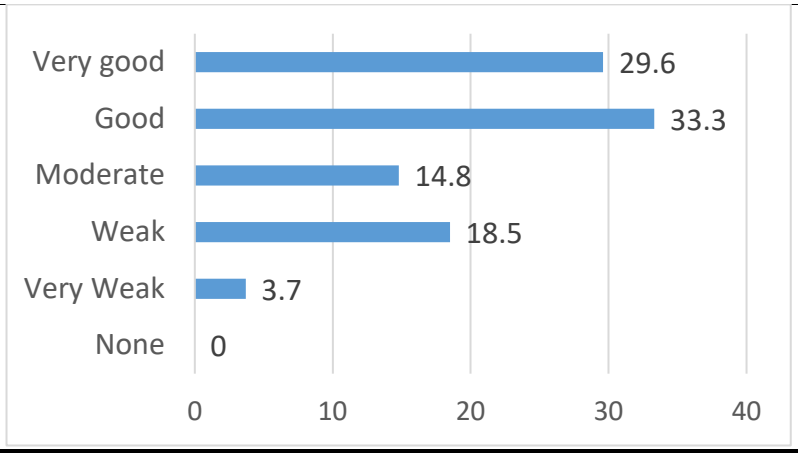


The promotion of research visibility scored moderately across HEIs with an average score of 3.3. The sub-dimension with the lowest score was 'whether the research section of the institution's website was up-to-date with on-going research, feed-back, and knowledge products (48.1% of the HEIs had a 'weak-to-none' score, with an average score for the sub-dimension of 2.4). This observation is consistent with the earlier observation under the capability of 'research project management and control' where it was noted that a major weakness was the lack of research management information systems that track the status of research projects in HEIs.

Research infrastructure: National research engagement

Figure 10: Distribution of capacity score grades for national research engagement among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	1	3.7
Weak	5	18.5
Moderate	4	14.8
Good	9	33.3
Very good	8	29.6
Total	27	100.0
Overall Mean Score	**3.7**	**Moderate -to-Good**

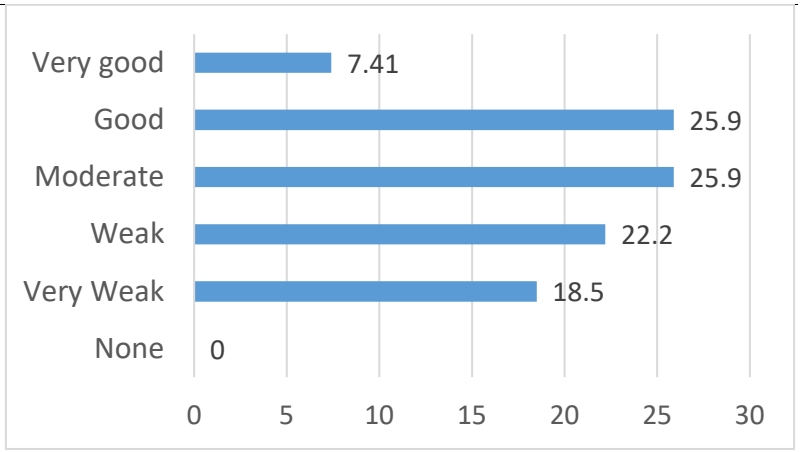


Universities on average scored fairly well in the capability regarding national research engagement, with an average score of 3.7 (moderate-to-good). It was the capability in which the universities had the highest average score. This covered engagement of policy makers and implementers and alignment of research strategies with national priorities. This finding is probably attributed to the fact that local universities are often respected by the leaders in their countries and they have the advantage of knowing local contexts.

Continuity and sustainability

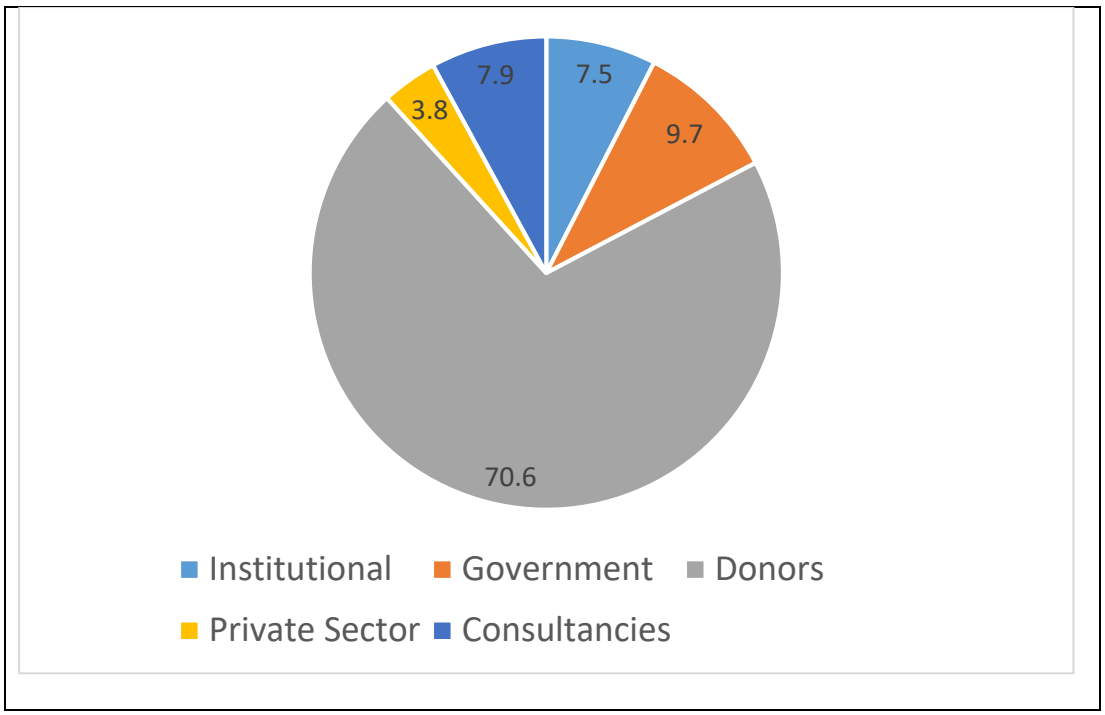
Figure 11: Distribution of capacity score grades for continuity and sustainability among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	5	18.5
Weak	6	22.2
Moderate	7	25.9
Good	7	25.9
Very good	2	7.41
Total	27	100.0
Overall Mean Score	**2.8**	**Weak-to-Moderate**



Continuity and sustainability for research was one of the weakest scoring areas among HEIs in Africa, with an average score of 2.8 (graded as 'weak-to-moderate'). The low score was mainly driven by inadequate funding for research support offices by universities (40.7% of HEIs returned a 'weak or very weak' score, with an average score of 2.7) and availability of internal funding for research that is provided by the university from its internally raised revenue (48.1% of HEIs returned a 'none-weak' score, with an average score of 2.6). This situation is well-illustrated when one considers the sources for research funding in HEIs in Africa. The current situation is presented in Figure 12 below:

Figure 12: Distribution of funding sources for research in HEIs in Africa



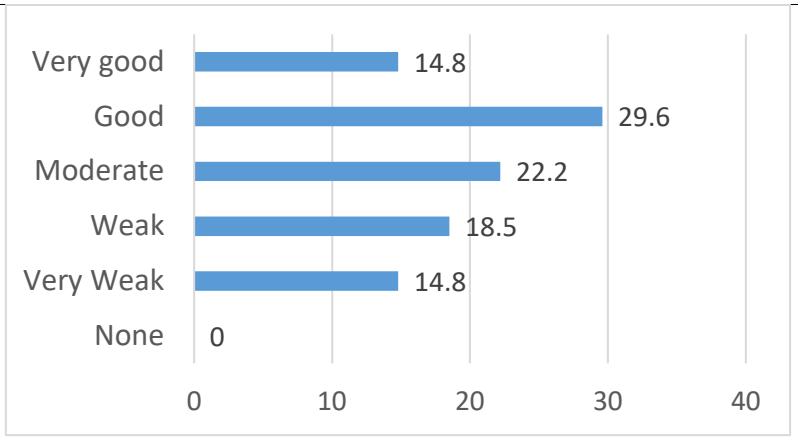
The findings show that 71% of research funding in HEIs in Africa comes from donors. Governments, the main stakeholders in development of countries, provide only 9.7% of funding while 7.5% of

funding comes from local institutional funds within HEIs. Private universities tended to provide more local institutional funding for research compared to public institutions. The private sector accounts for only 3.8% of funding to HEIs. Universities also obtain significant funding from consultancies (7.9%).

Linkages, partnerships and collaborations

Figure 13: Distribution of capacity score grades for linkages, partnerships and collaborations among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	4	14.8
Weak	5	18.5
Moderate	6	22.2
Good	8	29.6
Very good	4	14.8
Total	27	100.0
Overall Mean Score	**3.1**	**Moderate**



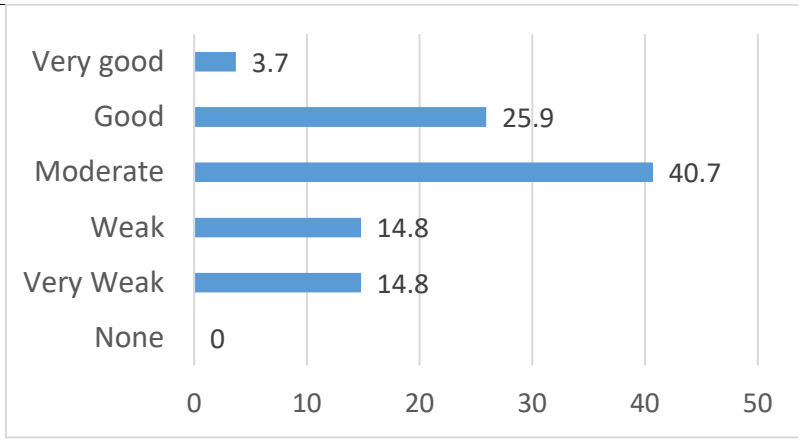
HEIs scored an average of 3.1, representing a 'moderate' status, in the area of linkages, partnerships, and collaborations. Among the areas of weakness, 37% of institutions scored 'weak-to-very-weak' on the sub-capability 'adequate access to HEI research collaborators from high income country universities' (mean score of 2.9). Likewise, 37% of HEIs scored 'weak-to-very weak' in the sub-dimension of 'availability of strong technical linkages with national and sector ministries and involvement in their technical working groups'.

It is worth noting that HEIs in Africa seem to have a relatively strong foundation in community linkages. On the sub-capability 'the institution has a strong linkage and presence as an implementer in the communities with community research or intervention sites', 79.4% of institutions had a score of 'moderate-to-very good', and 51.8% scored 'good-to-very good'.

Empowerment

Figure 14: Distribution of capacity score grades for empowerment of researchers among HEIs in Africa

Score Grade	No.	%
None	0	0.0
Very Weak	4	14.8
Weak	4	14.8
Moderate	11	40.7
Good	7	25.9
Very good	1	3.7
Total	27	100.0
Overall Mean Score	**2.9**	**Weak-to-Moderate**



Empowerment was one of the capabilities where, overall, the HEIs scored weakest, with an average score of 2.9 (weak-to-moderate). One of the key areas of inadequate empowerment was the support given to junior faculty. One-third of HEIs (33.3%) scored 'weak-to-none' regarding provision of adequate support to junior faculty to gain research experience through mentorships. Empowerment for female researchers also stood at moderate or lower for the majority of institutions. More notably, on the sub-capability 'the institution has incentives in place to support female researchers to lead research projects', two-thirds (66.7%) of HEIs surveyed scored 'weak-to-none' while one-in-six institutions (18.5%) had no incentives at all. It is not surprising therefore that only 19.8% of research projects were headed by female researchers. Four-fifths of the HEIs (81.5%) had less than 40% of their research projects headed by female PIs.

The issue of gender imbalance in research opportunities is rooted in several other factors characterizing the students and staff composition of these universities. Findings on these characteristics are summarized as follows:

- Only 48.2% (13/27) of academic units in the study's universities had an academic unit responsible for women and gender studies.
- The percentage of undergraduate students who are female ranged from 21.1% in the university with the lowest female enrollment to 61% in the one with the highest. One-in-five universities (22.2) have an undergraduate female enrollment that is less than 30%. Fifty-two percent of the universities have a percentage of female undergraduate students that is less than 40%. Eighteen percent of universities have over 50% female undergraduate enrollment. The mean enrollment for male undergraduate students is 7497 while that for females is 5298, representing a mean difference of 2198 students and a ratio of 1.4:1; male enrollment is 40% higher than female enrollment
- The percentage of graduate students who are female ranged from 0% in two universities to 65% in the university with the highest proportion of females. One-in-two universities (51.8%) have a graduate female enrollment that is less than 30%. Only two universities (7.4%) have over 50% female graduate enrollment. The mean enrollment for male graduate students is 1320 compared to 669, a ratio of 2:1.
- The percentage of PhD students who are female ranged from 0% in seven universities (25.9%) to 58% in the university with the highest proportion of females. Sixty-three percent have a PhD female enrollment that is less than 30%. Only two universities (7.4%) have over 50% female PhD enrollment. The mean enrollment for PhD students is 170 for males and 40 for females, a ratio of 4:1.

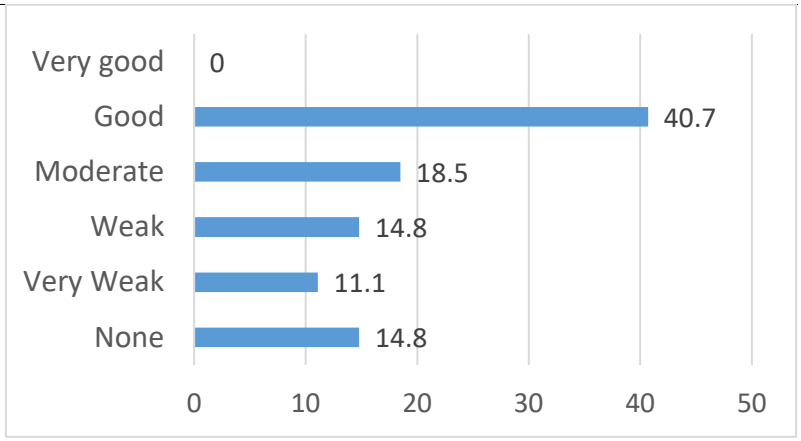
- The percentage of staff members who are female ranges from 9% in the lowest ranking university to 60% in the highest-ranking university. One-in-two universities (48.2%) have a percentage of female faculty that is less than 30%. The average number of male staff is 448 while that for females is 176, a ratio of 2.54:1.
- The percentage of staff members who are female and have a PhD ranges from 0% in three universities (11.1%) to 55.5% in the highest-ranking university. Seventy percent of universities have less than 30% of their PhD level staff being female. The average number of male staff with PhDs is 146 while that for females is 49, a ratio of 3:1.

Gaps in empowerment were also observed in the empowerment of academic units with low research outputs as earlier indicated in the section on institutional support mechanisms for research.

Leadership

Figure 15: Distribution of capacity score grades for research leadership among HEIs in Africa

Score Grade	No	%
None	4	14.8
Very Weak	3	11.1
Weak	4	14.8
Moderate	5	18.5
Good	11	40.7
Very good	0	0.0
Total	27	100.0
Overall Mean Score	**2.6**	**Weak-to-Moderate**

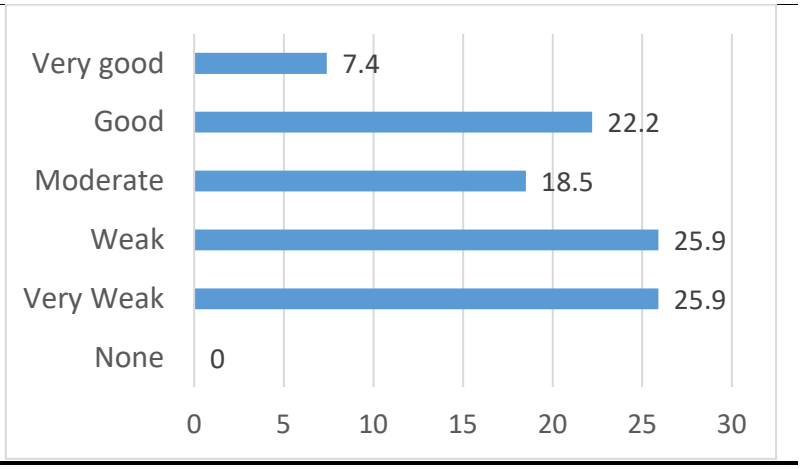


Research leadership also emerged as a key area of weakness affecting research capacity in African HEIs. HEIs scored an average of 2.6, representing a classification of 'weak-to-moderate'. This is mainly attributed to training courses that target cross-cutting non-technical skills important for management of research projects including research leadership, internal communication, and research project management being unavailable.

Dissemination, knowledge translation and research applicability

Figure 16: Distribution of capacity score grades for research dissemination, knowledge translation and research applicability among HEIs in Africa

Score Grade	No.	Percent
None	0	0.0
Very Weak	7	25.9
Weak	7	25.9
Moderate	5	18.5
Good	6	22.2
Very good	2	7.4
Total	27	100.0
Overall Mean Score	**2.6**	**Weak-to-Moderate**



Dissemination, knowledge translation, and research applicability was also one of the weakest areas identified from the assessment, with an average score of 2.6 (weak-to-moderate). All the key areas of assessment scored low including: availability of translation expertise (mean score of 1.9), credibility with the private sector (mean score 2.4), availability of translation support units (mean score of 2.5), and translation linkages with government sectors (mean score of 2.4). Forty-four percent of HEIs scored 'weak-to-none' on availability of a knowledge translation unit, while 55.6% scored 'weak-to-none' on availability of knowledge translation experts to support researchers. Regarding research linkages with the government in which governments channel their research needs directly to universities, 40.7% of institutions scored 'weak-to-none'. Likewise, 55.6% of HEIs scored 'weak-to-none' regarding having strong linkages with the private sector in which they provide innovative solutions to private sector needs.

On average, only 20.2% of research outputs from faculty and student researchers were translated into knowledge products other than journal articles and disseminated to stakeholders over a reference period of three years. In addition, only an average of15.6% of research outputs were reported to have resulted into discernible policy and program impact over a five-year reference period.

Research portfolio

Table 3: Distribution of the number of publications in the last academic year

No. of publications	No	%
0-9	3	11.1
10-49	11	40.7
50-199	5	18.5
200-999	6	22.2
1000+	2	7.4
	27	100.0

In general, the publication output of HEIs was moderate; 29.6% of HEIs had at least 200 peer-reviewed publications, while close to one-half (48.1%) had 50 or more publications. The total publication output from all 27 institutions was 6390, with a range of 0 publications to 2154.

Regarding the academic units with the largest and lowest number of research and innovation projects, the following emerged from the analysis:

Table 4: Academic units with the largest volume of research and innovations

Units with the largest volume of research	No	%	Units with the lowest volume of research	No	%
Health and Medical Sciences	8	29.6	Social Sciences, Arts and Humanities	8	29.6
Engineering and Technology	7	25.9	Education	3	11.1
Agriculture	5	18.5	Law	3	11.1
Science	3	11.1	Medicine/Oral Health	2	7.4
Political science	1	3.7	Allied Health Sciences	2	7.4
Social Sciences	1	3.7	Veterinary/animal science	1	3.7
Computer Science	1	3.7	Economics	1	3.7
Entrepreneurship & Business	1	3.7	Oral Health	1	3.7
			Agriculture	1	3.7
			Conflicts management	1	3.7
			Business Administration and Management	2	7.4
			None specified	2	7.4
Total	27	100.0	Total	27	100.0

The academic units reported to have the largest volume of research and innovations are (1) health and medical sciences, (2) engineering and technology and (3) agriculture. Academic units reported to have the lowest volume of research and innovations were (1) social sciences, arts and humanities, (2) education, and (3) law.

5.0 Conclusions and programmatic recommendations

5.1 Conclusions

This assessment shows that African HEIs have capacity gaps in all 13 capabilities related to the development research ecosystem. In general, the capability in which they showed the highest capacity score was in the area of 'national research engagement'. However, no capability attained an average score of 4.0 and above ('good to very good').

There were five areas in which HEIs scored the lowest - these areas are substantially weaker than the others and they are:

1) Research leadership and research project management
2) Research dissemination, knowledge translation, and research applicability
3) Empowerment, especially of female researchers and junior faculty
4) Continuity and sustainability of research, especially research funding
5) Institutional support services for research at the lower academic unit level

These five are the priority areas that should be targeted for the capacity enhancement of the Africa's HEIs' research ecosystems given that universities have been a key component of the national research ecosystems in the region. The research questions filled by this report align with the objective of LASER, which includes building the research ecosystem's capacity in HEIs. These findings therefore have important implications for LASER's capacity building strategy as they indicate the critical gaps that universities and national governments need to fill in order to build a vibrant research ecosystem in universities and in the countries.

However, the findings of this report should be interpreted keeping in mind that only 27 of hundreds of African HEIs were assessed. The findings therefore provide a case for issues that need to be flagged for priority setting, but are not generalizable to and do not represent all of the HEI contexts in Africa. The study methodology also included an over-sampling of universities in Uganda. However, the observations were weighted down in the combined analysis to make them proportionate to the entire sample.

5.2 Programmatic recommendations

In line with these findings, the following programmatic recommendations arise:

1. HEIs in Africa and the Sector Ministries under which they are aligned should aim to increase the capacity for research leadership. At the sector level, this requires increased funding for research activities in universities. At the HEI level, increased research capacity should be attained through institutionalization of training courses on research leadership and research project management and making them accessible to all researchers. Research policies that have been crafted by the universities need to be supported to roll down to the operational units.

2. To make universities more relevant to the national development priorities, universities should strengthen their linkages to government sectors when creating their research agendas. Government sectors should view universities as partners in development that can provide evidence-based solutions to priority development challenges. Research agendas need to be widely consultative, to include relevant sectors, private sector actors and implementing agencies, so that they reflect the priority information needs of entities at the forefront of development programs' implementations.

3. The continuity and sustainability of research should become a priority for African HEIs. Governments in the region should increase their investments in research by providing dedicated funding to research and innovation projects in universities, especially those that align with national development goals. Universities also need to engage governments to leverage more appropriations for research in the national budgets and to increase their in-house capacity to write grants to other funders. Universities should increase their lobbying and advocacy for increased funding for research, so that policy makers appreciate the role that research can play in transforming their countries. Universities also need to include a budget-line for supporting research using internal funds in their own local budgets.

4. HEIs and pertinent government sectors in Africa should improve the provision of institutional support services for research at their constituent academic units. This should include re-enforcing the research support infrastructure at the operating units (including research support and grants management offices, labs, libraries and information resources, IRBs, research communication support, internet, computers and software, and research skills training to mention just a few. Academic units with a large research and innovation portfolio and those with well-established research support infrastructure should mentor the lower performing academic units to increase the latter's research capability.

5. HEIs in Africa should enhance their capacity for research dissemination, knowledge translation, and promotion of research applicability. This should in part involve a) the establishment of fully fledged knowledge translation units that support researchers to develop knowledge products for different audiences and to disseminate them to relevant stakeholders for impact, b) inclusion in the establishment of an adequate number of knowledge translation experts to support researchers in developing communication and knowledge products, c) mainstreaming knowledge translation into all research training, d) establishing strong research dissemination and use partnerships with government and implementing partners, e) establishing strong linkages with the private sector for uptake of research products that are of interest to them.

6. HEIs in Africa should prioritize the empowerment of groups that are marginalized within their institutional research set-up. This should mainly include empowerment of female researchers, empowerment of young and upcoming researchers, and empowerment of academic units with low research outputs and impact.

7. Development agencies should increasingly engage African HEIs as partners in development. Being that African HEIs have the advantage of proximity to communities, development agencies and practitioners should engage them in research to provide more contextualized evidence of the development area, local implementation challenges and success factors, and intervention effectiveness.

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Appendix

A1. Tool for assessment of research context in higher education institutions in low- and middle- income countries

This tool should be filled in by the LASER network focal point or her/his designee in consultation with the university official in charge of coordinating research/research training in the university or an alternative officer with a good knowledge of the research context of the institution.

0. Background information			
0.01 Name of higher education institution:			
0.02 Country of location:			
0.03 Designation of the respondent to this tool:			
0.04 Number of Academic Units in the institution: *(Use the largest functionally semi-autonomous sub-division of the institution e.g. faculties, schools or colleges)*			
0.05 Is there an academic unit responsible for Women and/or Gender Studies in your institution?	Yes	No	
0.06 Total number of undergraduate students enrolled in the institution:	Total	Female	Male
0.07 Total number of graduate students enrolled in the institution:	Total	Female	Male
0.08 Total number of PhD students enrolled in the institution: *(across all units and programs)*	Total	Female	Male
0.09 Total number of academic staff in the institution:	Total	Female	Male
0.10 Total number of academic staff in the institution with a PhD:	Total	Female	Male

Guidance: In the subsequent sections, you will be presented with a set of questions, the majority of which require you to score the status of your institution using a Likert Scale of 0-5:

- 0 meaning 'there is nothing established in the institution with regard to that capability'
- 1 meaning about 1-20%
- 2 meaning about 21-40%
- 3 meaning about 41-60%
- 4 meaning about 61-80%
- 5 meaning about 81-100%

A few of the items require you to provide a direct number or a percentage based on your estimate of what is available in the institution. Provide the best possible estimate available to you.

1. Research infrastructure	0	1	2	3	4	5
1.1 Research Strategies and Policies						
1.1.01 Institution has a research policy and guidelines approved by its highest administrative organs and adopted by all academic units						
1.1.02 institution has a research agenda that was updated within the last 3-5 years and was developed in close collaboration with the constituent academic units and other relevant stakeholders outside the university (e.g. government, private sector, donors, etc.)						
1.1.03 Number of academic units (colleges, schools, or faculties) with unit-specific research agendas *(indicate number)*						

1.1.04 There is a clear mechanism for linking academic unit research agendas with the overall institutional research agendas						
1.1.05 Research is given as much support and incentives as teaching within the institution's setting						
1.1.06 Research output and dissemination is a prominent part of technical faculties' consideration for promotion within the university ranks						
1.1.07 Extent to which the institution has clear policies and mechanisms to support commercialization of research and innovations						
1.1.08 Extent to which the institution has clear policies and mechanisms for protection of intellectual property and commercialization of research.						
1.1.09 If available, the extent to which the policies and mechanisms for protection of IP and commercialization of research are favorable and agreeable to most researchers (e.g. ownership/IP, stake in findings and outputs, bureaucracy)						

1.2 Institutional Support Services and Infrastructure	0	1	2	3	4	5
1.2.01 Presence, accessibility and functionality of a research support office to coordinate research in the institution						
1.2.02 Presence, accessibility and functionality of a grants management unit/sponsored programs office to support grant applications and management						
1.2.03 Apart from the central research support office, number of individual academic units that have established their own research support offices *(indicate number)*						
1.2.04 Apart from the central grants management office Number of individual academic units that have established their own grants management units *(indicate number)*						
1.2.05 The roles and relationships between the central research support office and the lower academic unit (faculty/school/college) research support offices are streamlined						
1.2.06 Presence of sufficient numbers of adequately equipped basic research laboratories (adequate equipment, consumables and sundries) in all key development related disciplines requiring them, and with sufficient accessibility by researchers						
1.2.07 The institution's basic research laboratories have achieved international accreditation from appropriate international bodies						
1.2.08 The institution has sufficient libraries with adequate access to current literature and e-resources to support researchers in all academic disciplines						
1.2.09 The institution subscribes to sufficient numbers of quality journals that are made easily accessible to researchers						
1.2.10 For all research involving human subjects the institution has an adequate number of Institutional Review Boards (in terms of technical capacity and systems) to expeditiously review and approve the protocols in a manner that ensures protection of ethics						
1.2.11 Extent to which researchers have access to reliable high-speed internet (at least 3G), computers, and data storage capacity (including cloud services) to facilitate their work						
1.2.12 The institution has a clear policy for data sharing that is known by all researchers						

1.3 Supporting Funding Applications	0	1	2	3	4	5
1.3.1 The extent to which the institution has mechanisms for supporting (including funding) and coordinating timely, multi-disciplinary input into application proposal development						
1.3.3 The extent to which the institution has clear and functional processes for quality assurance, attainment of support documentation and authorization of proposals before submission						

1.4 Project Management and Control	0	1	2	3	4	5
1.4.1 The institution has a research information management system (electronic or manual) to track research projects including contracts and agreements, protocols, budgets, funding requirements, reports and deliverables, overheads, formal approval and continuous review						
1.4.2 The institution provides training in financial management and research administration for researchers and finance officers to increase clarity and understanding about their various roles						
1.4.3 Systems are in place to track financial spending against budget, accounting and auditing, and risk management of research projects						

1.5 Human Resource Management for Research	0	1	2	3	4	5
1.5.1 The institution has adequate research administrative support staff who are well remunerated and facilitated to support research projects and are included in the university structure						
1.5.2 The institution has a provision in its human resource structure for formal appointment of technical research staff *(e.g. research fellows/research professors etc.)*						
1.5.3 The institution has a predictable and sustainable remuneration structure for technical research staff						
1.5.4 Career tracks for research technical staff are established, with clear opportunities for progressing from a junior researcher to a senior researcher and are protected and implemented to motivate research staff						
1.5.5 The institution has a flexible contract structure for academic staff that allows a reasonable part of their time to be availed for research and community services in addition to their academic obligations, without being constrained by teaching loads						

1.6 Human Resource Development for Research	0	1	2	3	4	5
1.6.01 The institution has a formal induction program for young/upcoming researchers						
1.6.02 The institution has adequate formal training courses for researchers on basic and advanced research methods						
1.6.03 The institution has adequate formal training courses for researchers on skills that enhance research e.g. ICT use in research, data management, research communication, etc.						
1.6.04 All undergraduate programs have a research project and field placement as required credit gaining activities						
1.6.05 All graduate programs have a research project and field placement as required credit gaining activities						
1.6.06 The institution has active PhD training programs						
1.6.07 The institution has post-doctoral training programs to train researchers						

1.6.08 Total number of PhD level faculty in the areas of Agriculture, food-security and nutrition						
1.6.09 Total number of PhD level faculty in the areas of Democracy and Governance						
1.6.10 Total number of PhD level faculty in the areas of Environment and climate change						
1.6.11 Total number of PhD level faculty in the areas of Global health (including water and sanitation)						
1.6.12 Total number of PhD level faculty in the areas of water and sanitation						
1.6.13 Total number of PhD level faculty in the areas of Education						
1.6.14 Total number of PhD level faculty in the areas of Working in Crises and Conflict						
1.6.15 Total number of PhD level faculty in the areas of Gender and women's empowerment						
1.6.16 Total number of PhD level faculty in the areas of Ending Extreme Poverty						
1.6.17 Total number of PhD level faculty in the areas of ICT and Digital development						
1.6.18 Total number of PhD level faculty in the areas of Energy						

1.7 Promotion of Research	0	1	2	3	4	5
1.7.1 The institution has a dedicated unit for promoting visibility of institutional research activities and outputs						
1.7.2 The research section of the institution's website has up-to-date information on on-going research projects including updates, interim feed-back, a knowledge dissemination portal						
1.8 National Research Engagement	0	1	2	3	4	5
1.8.1 The extent to which the institution has sufficient opportunities for engagement of policy-makers, program implementers/development practitioners at a national level for uptake of research for development						
1.8.2 The extent to which the institution's research strategy is aligned with the national development strategy						

2. Continuity and sustainability	0	1	2	3	4	5
2.1 Extent to which the research support offices receive adequate funding to undertake their activities						
2.2 The institution has a functional provision to fund research from within its own local funds in addition to external funding						
2.3 Percentage of the total expenditure on research that is funded by the Institution *(indicate percentage)*						
2.4 Percentage of the total institution's expenditure on research that is funded by donors *(indicate percentage)*						
2.5 Percentage of the total institution's expenditure on research that is funded by the private sector *(indicate percentage)*						
2.6 Percentage of the total institution's expenditure on research that is funded by faculty consulting research activities *(indicate percentage)*						
2.7 Percentage of the total expenditure on research that is funded by government *(indicate percentage)*						

3. Linkages, partnerships and collaborations	0	1	2	3	4	5
3.1 Number of active research-based MoUs and partnerships with other entities (*indicate number)*						
3.2 Number of active research-based contracts with other entities (*indicate number)*						
3.3 Number of active research grants and/or partnerships with the national government *(indicate number)*						
3.4 Number of active research grants and/or partnerships with the private sector *(indicate number)*						
3.5 Number of active research grants and/or partnerships with development agencies *(indicate number)*						
3.6 The institution has adequate access to HEI researchers from high-income country universities for partnering on research grant applications and implementation						
3.7 The institution has a strong linkage and presence as an implementer in the communities with community research sites or project implementation sites						
3.8 The institution has strong technical linkages with national level sector ministries and is involved in their technical working groups						

4. Empowerment	0	1	2	3	4	5
4.1 Junior staff are adequately supported to gain research experience by including them on research initiatives as associates or assistants						
4.2 Female researchers are adequately involved in research						
4.3 Estimated percentage of females among all technical faculty in the institution *(indicate percentage)*						
4.4 Estimated percentage of Principle Investigators on research projects in the institution that are female *(indicate percentage)*						
4.5 The institution has incentives in place to promote female researchers to lead research projects						

5. Leadership	0	1	2	3	4	5
5.1 The institution has training courses that target cross-cutting non-technical skills important for management of research projects like leadership, supervision, and project management						

6. Dissemination, knowledge translation and research applicability						
6.1 Institution has a fully-fledged knowledge translation unit that supports researchers to disseminate their findings for impact						
6.2 The institution has an adequate number of knowledge translation experts to support researchers in developing communication and knowledge products						
6.3 Institution has a clear research relationship with government in which governments channel their research needs directly to the institution						
6.4 Institution has strong credibility with the private sector as a source of innovations and research evidence for private businesses						
6.5 Estimated percentage of research outputs from faculty and student researchers that were translated into knowledge products other than journal articles and disseminated to stakeholders in the last 3 years *(indicate percentage)*						
6.6 Number of research dissemination events held with stakeholders in the last academic year *(indicate number)*						

6.7 Estimated percentage of research outputs that result in policy or program impacts in the last 5 years *(indicate number)*						

7. Research portfolio	0	1	2	3	4	5
7.01 Total number of publications from the institution in the last full academic year *(indicate number)*						
7.03 What is the estimated amount of research funds per year that the unit with the largest amount of research funding handles?						
7.041 For the academic unit receiving the largest amount of research funding, who is their top largest funding source/sponsor?						
7.042 For the academic unit receiving the largest amount of research funding, who is their second top largest funding source/sponsor?						
7.05 What is the estimated amount of research funds per year that that the unit with the highest amount of research funding handles?						
7.061 Name the top academic unit in the institution with the highest quantity of innovations (not basic research) portfolio *(an innovation can be a novel approach, product or service)*						
7.062 Name the top academic unit in the institution with the highest quantity of research						
7.061 Name the top academic unit in the institution with the lowest innovations (not basic research) portfolio *(an innovation can be a novel approach, product or service)*						
7.062 Name the top academic unit in the institution with the lowest quantity of research						

8. Additional comments and observations
8.1 Do you have any additional comments and observations regarding the research context in your institution?
8.2 Do you have any additional comments and observations regarding the research context in the region at large?

SUBMIT (Are you sure you want to submit?) Yes/No

END: Thank you very much for participating in this initiative and for providing this valuable information! Feed-back will be provided to you on the outcome of this continent-wide analysis.