The future sources of research funding for basic research and engineering in Kenyan Universities — the case of TTUC

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Background

- Africa Produces only 1.8% of the global research output
- 50% pf the Research is done in South Africa and Egypt (as measured by Publications)
- Top 8 countries account for 80% of the research publications
- 88% of the inventive activity concentrated in South Africa (Patents)
- The quantity and quality of research is improving but very slowly
- Most research focuses on Agriculture and Health Sciences
- SSA research output in Science, Technology, Engineering, and Mathematics (STEM) lags behind that of other subject areas significantly.
- SSA, especially East Africa and Southern Africa, relies heavily on international collaboration and visiting faculty for their research output.

Pouris & Pouris 2009
Adams et al 2010
Relevance of Science to Kenya

• Food Security
• Health
• Energy/Water
• Environment
• Wealth Creation
• Employment
• Political Stability/Democracy/Governance Systems

NB: As was noted in a 2007 UNESCO report, science and technology are critical not only to the continent’s economic prosperity but to such matters as food security, disease control, access to clean water, and environmental sustainability
The Disciplines Sciences

- Chemistry
- Physics
- Geology
- Geography
- Mathematics
- Biology
- Humanities

Michael White: “If we want tangible, scientific solutions to society’s urgent problems, then we need to invest in basic, curiosity-driven research that’s not motivated by its potential for practical applications,”

• Is Basic relevant in themselves? Would they attract funding in themselves?
• Funding is absolutely essential to science and Technology
• There are many donors that have dedicated their resources to funding education, training and research
• Grant giving organizations include:
  - Governments (NCST, BMBF)
  - Foundations (Private, Family)
  - Companies (DuPont, Diversa)
  - Regional Blocks (European Union, VicRes)
  - Development Agencies (UNDP, World Bank, DFID etc)
Challenges of Research In Kenya

• Policy
  • Basic Vs Applied or Basic + Applied?
  • University structures designed more for teaching

• Capacities to Manage Research

• Funding/Incentives
  • Lack of local funding sources (except for South Africa)
  • Donor driven/Donor dependence
  • The absence of industrial participation

• Personnel
  • Low number of PhDs
  • Shortage of peers
  • Brain drain vs brain gain
  • Intra-Africa cooperation

• Infrastructure
  • Few Research labs/poorly equipped
  • ICT and Information resources
<table>
<thead>
<tr>
<th>Policy</th>
<th>Macro</th>
<th>Meso</th>
<th>Micro</th>
<th>Meta</th>
</tr>
</thead>
</table>
|            | BMBF Guidelines - The Big 5 - Competitions - Tax Cuts | **Stifterverband** Lobbying  
**Research Institutes** Requirements for Directorships | **FU Berlin** Potsdam Research Institutes | Parliamentary Research Committee  
How to get the voters and the media? |
|            | HRK Lobbying by Us WZB Policy Analysis     |                                           |                                            |                                           |
| Incentives | DFG Nation-wide Competitions               | **CHE Multidimensional Ranking**  
**Fraunhofer Society** Platform for U + Industry  
**Stifterverband Support** | **FU Berlin** Internal Competition, Seed Money | CHE  
Is Ranking PR?  
Importance of Media Partners |
| Capacity   | DAAD - HRK - CHE - WZB - Stifterverband Workshops and Publications | **Pearls Network** Secretariat – GO:IN  
**DFN** Research Network | **FU Berlin** Proposal Writing  
Dahlem Research Sch.  
**Stifterverband - CHE** Science Management Master Programmes | **FU Berlin** e.g. Berlin Long Night of Science for general public |
|            | DAAD, HRK DIES Visits                      |                                           |                                            |                                           |
| Cooperation| **BMBF Science Cooperation Agreement?**    | **Cooperative Professorships**  
Open Data | **Networking Evening**  
BMZ: DAAD, AvH, GIZ  
BMBF: DAAD, DLR Support Programmes | **IUCES-DAAD**  
QA triggers more research  
**MdBs**  
Embassies |
|            |                                           |                                           |                                            |                                           |
### Research Management Matrix – Modified from Christoph Hansert

<table>
<thead>
<tr>
<th>Macro</th>
<th>Meso</th>
<th>Micro</th>
<th>Meta</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- MOEST/Government</td>
<td>- Commissions for University Education</td>
<td>- Universities VCs, Deans, Senators</td>
<td>- Parliamentary Committees (Budget/Education)</td>
</tr>
<tr>
<td>- HE Reforms</td>
<td>- Commission for Science and Technology (NACOSTI), NRF</td>
<td>- QA Visits</td>
<td>- Media Contacts</td>
</tr>
<tr>
<td>- DIES Info Visit</td>
<td>- National Conferences</td>
<td>- Round Tables Meetings</td>
<td></td>
</tr>
<tr>
<td>- Research funding</td>
<td>- DIES Info Visit</td>
<td>- Education Research Centre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Kenya Institute of Policy Research and Analysis (KIPRA), LIWA</td>
<td>- Industry linkages</td>
<td></td>
</tr>
<tr>
<td><strong>Incentives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Joint PhD Scholarships with MoEST</td>
<td>- Field Research Grants for PhD students</td>
<td>- Additional Master and PhD grants</td>
<td></td>
</tr>
<tr>
<td>- Centres of Excellence</td>
<td>- Research Group Competition</td>
<td>- Guest and Adjunct lecturers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- PhD Scholarships</td>
<td>- Equipment Grants</td>
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<tr>
<td></td>
<td>- A funding formula for research</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Research Infrastructure</td>
<td>- “Cooperation Grants”</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Centres of Excellence</td>
<td></td>
</tr>
<tr>
<td><strong>Alliances</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- MoHEST</td>
<td>- DAAD Alumni/Humboldt Clubs/AGNES</td>
<td>- Alumni-Chapters</td>
<td></td>
</tr>
<tr>
<td>- World Bank, ECDG</td>
<td>- NCST, CHE</td>
<td>- Deans</td>
<td></td>
</tr>
<tr>
<td>- Kenya Open Data</td>
<td>- ICIPE, ILRI, ANSTI, RUFORUM,</td>
<td>- DVCs</td>
<td></td>
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<tr>
<td>- Vice-Chancellors Committee</td>
<td>- County Government</td>
<td>- International Partnerships</td>
<td></td>
</tr>
<tr>
<td>- AU/AAU/CODIGSET</td>
<td></td>
<td>- Science congress in High schools</td>
<td></td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Training on Science management</td>
<td>- Training for Staff of NCST, CUE, Research Centres</td>
<td>- E-resources, Posters, Scientific writing, Deans Course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Capacity of African QA System</td>
<td>- DIES Trainings</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Proposal Writing Seminars</td>
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<tr>
<td></td>
<td></td>
<td>- Summer Schools</td>
<td></td>
</tr>
</tbody>
</table>

### Journalists
- Media Houses?
Research Performing Organizations in Kenya
The Kenyan Research Management System

• No Research Policy but STI Policy
• No Research Agenda
• Largely donor dependent. Government pays salaries, researchers source for funds wherever they can.
• Biased towards applied research- assumed to be the only “relevant” research
• Hampered by weak Macro (Policy), Meso (Incentives) and Meta (Public support and awareness) levels
• A few Institutions focusing on a few areas.
• Few researchers
• An attempt to create the Macro-Level Institutions (NRF, NACOSTI, KENIA)
• Un-coordinated International Cooperation
The Micro-level in Kenya

• Research Institutes
  • KEMRI-Medical
  • KALRAO-Agriculture/Livestock
  • KEMFRI (Marine)
  • National Museums of Kenya (Culture/Biodiversity/Paleontology)
  • Kenya Wildlife Service (research, conservation, regulation and policing)
    • Strong partnerships with International Research agencies/donors

• 34 Public Universities and University Colleges
  • Weak postgraduate programs in most universities
  • Weak research output
Taita Taveta University College (TTUC)

• Started to address challenges in Access to Higher Education in Kenya

• Started in 2007 as JKUAT Taita Taveta Campus to offer Mining and Mineral processing Engineering

• 2011-changed to a Constituent College of JKUAT

• Students stand at 2400 students in Postgraduate, Degree, Diploma, Certificate courses)

• Working towards being a Centre (of Excellence) for Mining Education in the region
Building a University

Modern Quality Academic Programs

Research

Qualified Staff

Internationalization

Relevance

World Class Support services
Transformation at TTUC

1998-2007
0-students
0-programs
0- Budget

2007-2012
1000 students
5 programs
80 M Budget

2012-2015
-2400 students
-10 programs
-500 M Budget

2016-2020
5,000 students
50 programs
6 campuses
2 Billion Budget
Approved Academic Profile

School of Science and Informatics

School of Agriculture, Earth and Environmental Sciences

School of Mines and Engineering

School of Business, Economics and Sociology

School of Health Sciences

The Home of Ideas
<table>
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<tr>
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<td></td>
<td>GOK Female</td>
<td>SSP Female</td>
<td>GOK Male</td>
<td>SSP Male</td>
<td>GOK Female</td>
<td>SSP Female</td>
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<td>BSc. Mining &amp; Mineral Processing Eng.</td>
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<td>22</td>
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<td>4</td>
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<td>Bachelor of Commerce</td>
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<tr>
<td>Bachelor of Purchasing &amp; Supplies Management</td>
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<tr>
<td>BSc. Information Technology</td>
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<tr>
<td>BSc Mathematics &amp; Computer science</td>
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<td>Bachelor of Business Information Science</td>
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<tr>
<td>BSc Statistics</td>
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<tr>
<td>Certificate / Diploma in Information Technology</td>
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<tr>
<td>Certificate / Diploma in Purchasing &amp; Supplies Management</td>
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<td>Bridging Course in Mathematics</td>
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<td>MSc. Information Technology</td>
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<tr>
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<td>Genderized Totals</td>
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<td>22</td>
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<td>0</td>
<td>135</td>
<td>317</td>
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<td>TOTALS</td>
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<td>499</td>
<td>457</td>
<td>570</td>
<td>601</td>
<td>2016</td>
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# GOK Support to TTUC

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Budget allocation (Ksh)</th>
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<tbody>
<tr>
<td>2011/2012</td>
<td>No Budget</td>
</tr>
<tr>
<td>2012/2013</td>
<td>• Recurrent 135 M</td>
</tr>
<tr>
<td></td>
<td>• Capital 50 M</td>
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<tr>
<td>2013/2014</td>
<td>• Recurrent 254 M</td>
</tr>
<tr>
<td></td>
<td>• Capital 168 M</td>
</tr>
<tr>
<td>2014/2015</td>
<td>• Recurrent 322 M</td>
</tr>
<tr>
<td></td>
<td>• Capital 174 M</td>
</tr>
<tr>
<td>2015/2016</td>
<td>• Recurrent 362 M</td>
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<tr>
<td></td>
<td>• Capital 195 M</td>
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</tbody>
</table>

## Staffing Levels

<table>
<thead>
<tr>
<th>TTUC STAFF AS AT NOVEMBER 2015</th>
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<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Division</td>
</tr>
<tr>
<td>Female</td>
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<tr>
<td>Non-Teaching</td>
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<tr>
<td>73</td>
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<tr>
<td>Teaching</td>
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<tr>
<td>17</td>
</tr>
<tr>
<td>Grand Total</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>Academic staff on study leave</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>Academic staff on leave of absence</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>Total Academic Staff Away</td>
</tr>
<tr>
<td>13</td>
</tr>
</tbody>
</table>
Focus of Fundraising Efforts at TTUC

• MSc and PhD Training
• Short-Term and Long-Term Lecturers
• Research Projects
• International Cooperation/Centres of Excellence
• Workshops/Research Surveys
Funding to Bridge the skills gap - MSc and PhD Training

- http://nairobi.daad.de
- www.dfg.de
- NRW Graduate Schools
- Graduate Schools in Lower Saxony
- International Graduate Schools in Bavaria
- DAAD-Leibniz-Scholarships for PhD Candidates and Postdoctoral Students
  - http://www.dfid.org
  - http://nairobi.usaembassy.gov (Fulbright fellowships)
- African Development Bank-Japanese fellowship foundation (Contact Person is Mrs Francois Ande-Koue f.ande@afdb.org)
- Aga Khan Foundation (http://www.hon.ch/Misc/sponsor/aga_khan.html)
MSc and PhD continued

- Catholic Academic Exchange Service ([www.kaad.de](http://www.kaad.de))
- e7 Sustainable Energy Development Scholarship program
- United Nations Universities (Institute of Advanced Studies)
  - ([http://www.ias.unu.edu/fellowships/fellowships.cfm](http://www.ias.unu.edu/fellowships/fellowships.cfm))
- African Centre for Crop Improvement ([http://www.acci.org.za](http://www.acci.org.za)) supported by the Bill and Melinda Gates Foundation
### TWAS Support For Postgraduate Training

<table>
<thead>
<tr>
<th>Tenable in</th>
<th>Field</th>
<th>Age limit</th>
<th>Programme</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Natural sciences</td>
<td>30 years</td>
<td>Doctoral Fellowships in Brazil Leading to a Ph.D. in Natural Sciences</td>
<td>31 August each year</td>
</tr>
<tr>
<td>China</td>
<td>Natural sciences</td>
<td>35 years</td>
<td>CAS-TWAS Fellowships for Postgraduate Research in China</td>
<td>31 August each year</td>
</tr>
<tr>
<td>India</td>
<td>Natural sciences</td>
<td>no</td>
<td>CSIR-TWAS Fellowships for Postgraduate Studies in India</td>
<td>1 June each year</td>
</tr>
<tr>
<td>India</td>
<td>Biotechnology</td>
<td>30 years</td>
<td>DBT-TWAS Biotechnology Fellowships for Postgraduate Studies in India</td>
<td>31 August each year</td>
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<tr>
<td>India</td>
<td>Physical sciences</td>
<td>30 years</td>
<td>Postgraduate Fellowships in Physical Sciences at the S.N. Bose National Centre for Basic Sciences</td>
<td>31 August each year</td>
</tr>
<tr>
<td>India</td>
<td>Natural sciences</td>
<td>30 years</td>
<td>IACS-TWAS Postgraduate Fellowships in India</td>
<td>30 June each year</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Molecular sciences</td>
<td>30 years</td>
<td>CEMB-TWAS Postgraduate Fellowships in Pakistan</td>
<td>30 June each year</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Chemical and biological sciences</td>
<td>30 years</td>
<td>ICCBS-TWAS Postgraduate Fellowships in Pakistan</td>
<td>30 June each year</td>
</tr>
</tbody>
</table>
Funding for PostDoc and Research

• Humboldt Foundation [www.avh.de]
• German Research Foundation [www.dfg.de]
• International Foundation for Science [www.ifs.se]
• The world academy of sciences [www.twas.org]
• Japanese Society for Promotion of Science [https://www.jsps.go.jp/english]
• European Union [http://ec.europa.eu/programmes/horizon2020/]
• European research council [https://erc.europa.eu/funding-and-grants]

Supporting top researchers from anywhere in the world
DAAD Instruments exploited by TTUC

• Herder Senior Professorship
• Short-Term Lectureship
• Fact Finding Missions

Partnerships
- HTW Dresden
- University of Applied Sciences Zittau/Gorlitz
- University of Applied Sciences Dresden
- TU Bergakademie Freiberg

PROF. VOLKMAR KREISSIG - Business Technology
PROF. JURGEN SCHOENHERR - Process Engineering
DR CARSTEN LAUER - Geotechnical Engineering
PROF. JAN BONGAERTS – Resource Economics/Sustainability

4 OTHERS SHORT TERM LECTURERS CANCELLED AFTER GARISSA ATTACK.
Centres of Excellence for Promoting Future Leaders in Africa

By establishing Centres of Excellence at leading African universities, the DAAD aims to create modern educational capacities of supraregional influence. The improvements in the educational quality and the greater research capacity available at these world-class hubs will enable the next generation of leaders to acquire training in line with international standards. The goal for each centre is to strive to develop its own impact on the region and beyond.

DAAD - with the support of the German Federal Foreign Office - is funding this programme.
DAAD Programm Fachzentren in Afrika

KENGER CEMEREM

Kenya-German Centre for Mining, Environmental Engineering & Resource Management (2016-2020)

Ein Kooperationsvorhaben der TTUC, HTW Dresden und der TU BA Freiberg
Strategies

Capacity building, training of staff and students (2016-2017)

- PhDs for staff members
- MSc for 8 students in country/region
- Review and Development of curriculum BSc Curriculum
- Summer Schools in Germany for MSc students and staff
- Visiting Lecturers at TTUC
- Short courses for participants from industries and ministries
- Capacity Building of Laboratory and Administrative personnel
- Improving the Laboratory infrastructure
- Partnership with Industry
- Setting up a research infrastructure
- Joint promotion events and publicity

Eur. 360,000 for 2 years with a possibility for extension for 2 years
Lewis Glacier (Kenya)
Glacier microbe field work with JKUAT/TTUC and KWS funded by NACOSTI and JSPS

Sep. 2015 (Uetake)

Feb. 2012 (Nicholson et al. 2013)
Sample collection

No GMGA, but including much snow algae
International DAAD Alumni Expert Seminar

Participatory Watershed Planning for the Tsavo River Sub-Catchment
Kenya

August-September 2013

Supported by
German Academic Exchange Service (DAAD)
GIZ – Water Sector Reform Programme (WSRP)
Severin Safari Camp Tsavo West National Park

The Planning Team: DAAD Alumni and Tsavo River Stakeholders

Centre for International Capacity Development (CICD), University of Siegen, Germany
Taita Taveta University College, Kenya
GIZ – Water Sector Reform Programme, Kenya
Water Resources Management Authority, Kenya
DAAD Alumni

Report on field studies in Voi, Kenya

Soil Erosion and Flood Risk Management

Research for Devolution

Institute of Innovation & County Economic Transformation

Operationalization

Emmanuel Nzai
CEO, Linkagepoint
29 July 2015

Status Update../1

1. A JOINT COLLABORATIVE INITIATIVE between TTUC & Linkagepoint
   - MoU Signed and operational to PROVE CONCEPT

1. PROOF OF CONCEPT – SUCCESSES

   - KILIFI COUNTY
     - RRI / Performance Contracting

   - TAITA TAVETA COUNTY
     - RRI/Performance Contracts/CBEF
     - Transform Taita Taveta 2020/ Investor Brief
     - MoU with Vision 2030

   - KWALE COUNTY
     - RRI
     - 10 Year Sector Strategies

   - LAMU COUNTY
     - RRI
     - Investor Brief
     - 10 Year Sector Strategies (Ongoing)
     - MoU with Vision 2030

   - JUMIA YA KAUNTI YA PWANI
     - MoU signed with - 6 coastal counties & 3 Public Universities
Looking into the future

- The promise of investing 2% research must be realized
- Counties must set aside money for research and Institutional building
- Funding must be made available for all disciplines
- The NACOSTI, NRF and KENIA need capacity building to serve the scientific community in Kenya
- Accessing International funds requires collaborators
- Quality research and education depends on the quality of staff
- Strong PhD research programs essential to quality