The Role of Universities in African Countries

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Outline

• University Education in Africa
• University Education in Kenya
• Challenges Confronting African: A full plate
• The Taita Taveta University: Interpreting the University Mandate
• Mining in Kenya
• Working with the Government
• Working with County Government
• Working with Industry
• The Challenge of Research in Africa
• Growing Centre of Excellence
• The Quality Challenge
• Conclusion
History

• 1996-2000
  • PhD Work at the University of Konstanz, Germany
  • AG Brune/AG Schink
  • Isolation and Characterization of Microorganisms from soil-feeding Termitinae
  • Introduced to Microbial Ecology/
  • Supported by the German Academic Exchange Service (DAAD)

• 2005-2006
  • Post Doc, Max Plank Institute for Terrestrial Microbiology
  • AG- Brune
Background-University Education in Africa

• Agenda 2063 is the plan for Africa's transformation, agreed by the 54 members of the African Union in 2013.
• The goal is to build in 50 years “a prosperous and united Africa based on shared values and a common destiny”
• The plan sees an African 'renaissance', hinged on public and private investment in education, technology, science and research.
• By 2063, 70% of High School graduates should proceed to tertiary education with emphasis on Science and Technology
• In the last 15 years the student population in Tertiary Institutions in Africa has doubled from 6 Million to 12 Million

Source: https://www.britishcouncil.org/voices-magazine/universities-are-heart-africas-economic-rise
Background-University Education in East Africa

• There has been a rapid increase in the number of universities in East Africa over the last 15 years.

• National governments are investing in research and education, because they see economic growth in moving from agrarian to industrial and service economies.

• Dramatic Growth in East African Countries: Tanzania, Burundi, Rwanda, Uganda, Sudan, Ethiopia, Eritrea, Djibouti, Somalia, and Kenya

• Ethiopia has 60 New Universities in the last 20 years
Background: University Education in Kenya

• Guided by Universities Act 2012
• Establishes The Commission for University Education (CUE) and defines its functions
• Sets out the Objectives of University Education and functions of Universities
• Section 3.(1) The objectives of university education shall include—
  (a) advancement of knowledge through teaching, scholarly research and scientific investigation;
  (b) promotion of learning in the student body and society generally;
  (c) promotion of cultural and social life of society;
  (d) support and contribution to the realization of national economic and social development;
  (f) education, training and retraining higher level professional, technical and management personnel
  (g) dissemination of the outcomes of the research conducted by the university to the general community;
  (h) facilitation of life-long learning through provision of adult and continuing education;
Background: University Education in Kenya

• Kenya has 78 New Universities and University Colleges. Public Universities rose from 7 in 2007 to 41 in 2017 (10 Years).

• The oldest is the University of Nairobi started in 1970

• The Youngest is Garissa University chartered in 2017
  • Public Chartered Universities 31
  • Public Constituent Colleges 6
  • Private Chartered Universities 18
  • Private Constituent Colleges 5
  • Institutions with Letters of Interim Authority 14

• Total 74

• Source: Commission for University Education (www.cue.or.ke)
Challenges Confronting African: A full plate

- Natural Resources VS Poverty
- Favorable weather pattern VS Food insecurity
- Land Wealth VS Squatters
- Educational opportunities VS Illiteracy
- Communities VS Poor Political Leadership/Governance.
- Access for goods and people VS Mobility and Logistics
- Business VS Society
- Drugs, Al Shabaab VS Security of people and property
- MRC, Pwani Si Kenya, Secession VS National Cohesion
- Declining Water Resources VS Bulging Population
- Drought and Climate change VS Improved Livelihood
Kenya population forecast

<table>
<thead>
<tr>
<th>Population</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2050</th>
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</thead>
<tbody>
<tr>
<td>Total Estimated Population</td>
<td>41.8 million¹¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total, millions</td>
<td>28,688,599</td>
<td>33,445,119</td>
<td>38,610,097</td>
<td>100,960,657</td>
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<tr>
<td>Female, millions</td>
<td>15,504,079</td>
<td>17,201,337</td>
<td>18,764,959</td>
<td>48,640,000</td>
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<tr>
<td>Male, millions</td>
<td>14,704,286</td>
<td>16,243,783</td>
<td>17,743,296</td>
<td>48,901,000</td>
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<tr>
<td>Urban, millions</td>
<td>5,429,790*</td>
<td>7,719,000</td>
<td>12,023,570b</td>
<td>44,302,000</td>
</tr>
</tbody>
</table>

Population 2014: 45.55 m
The Challenge Posed by Violent Extremism

- Al-Shabaab, Boko Haram
- Al-Qaeda, ISIS

Fuel Conflict
- Exploit local realities and Tension

African Governments have taken long to understand the problem
- CT measures further fuel conflict and marginalisation

Countering violent extremism: The Horn of Africa
by José Luengo-Cabrera and Annelies Pauwels
The Economic Activities of the Kenyan Coast

OCHIEWO & ONDARI 2007

State of the Coast Report

Fig 5.1: Sector Share Contribution to Coast Economy.
Why the Coast is suffering

- LIKONI CLASHES
- KIKAMBALA BOMBINGS
- POST ELECTION VIOLENCE
- TOURIST ABDUCTIONS, CHARTER WITHDRAWAL, AL-SHABAAB & PRE-ELECTION ANXIETY


137,402 159,152 278,021

116,914 187,151 233,844

262,070 970,000

12/22/2017
Logistical Nightmare in Paradise
Refugees into Kenya 2010 - 2014

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<tbody>
<tr>
<td>Burundi</td>
<td>1,496</td>
<td>2,700</td>
<td>4,271</td>
<td>5,453</td>
<td>6,568</td>
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<tr>
<td>Democratic Republic of the</td>
<td>9,133</td>
<td>11,416</td>
<td>12,768</td>
<td>14,510</td>
<td>17,303</td>
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<tr>
<td>Congo</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Eritrea</td>
<td>1,686</td>
<td>1,820</td>
<td>1,880</td>
<td>1,748</td>
<td>1,566</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>35,309</td>
<td>35,120</td>
<td>32,687</td>
<td>31,209</td>
<td>30,478</td>
</tr>
<tr>
<td>Rwanda</td>
<td>1,946</td>
<td>1,867</td>
<td>1,550</td>
<td>1,430</td>
<td>1,443</td>
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<tr>
<td>Somalia</td>
<td>353,208</td>
<td>519,411</td>
<td>513,421</td>
<td>477,424</td>
<td>427,311</td>
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<tr>
<td>South Sudan</td>
<td>-</td>
<td>-</td>
<td>34,607</td>
<td>46,176</td>
<td>89,474</td>
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<tr>
<td>Sudan</td>
<td>26,998</td>
<td>28,340</td>
<td>5,747</td>
<td>7,962</td>
<td>9,631</td>
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<tr>
<td>Uganda</td>
<td>934</td>
<td>910</td>
<td>1,011</td>
<td>1,121</td>
<td>1,399</td>
</tr>
<tr>
<td>Other</td>
<td>161</td>
<td>177</td>
<td>171</td>
<td>190</td>
<td>190</td>
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<tr>
<td>Grand Total</td>
<td>430,871</td>
<td>601,761</td>
<td>608,113</td>
<td>587,223</td>
<td>585,363</td>
</tr>
</tbody>
</table>

- Training for BSc, MSc and PhD for Refugees
- Contribute to the Capacity Building of Refugees for the eventual return
- Kenyan Universities active in Somalia and South Sudan
- Possibility for Research
The Taita Taveta University: Interpreting the University Mandate

- Relevant Academic Programs
- Research
- Qualified Staff
- Internationalization
- Relevance
- Support services

12/22/2017 DAAD Akademie Meeting, Berlin
About Taita Taveta University

Geographical location of TTU

 Nairobi – Voi = 360 Km; Voi – Mombasa = 150 Km;
 Voi – Mt Kilimanjaro = 138 Km

Taita Taveta County
Growth and Transformation at TTU

- **1998-2007**: Proposed Voi TTC
  - 0 students

- **2007-2012**: JKUAT Taita Taveta Campus
  - 1000 students
  - 5 programs

- **2012-2016**: Taita Taveta University College
  - 2000 students
  - 10 programs
  - 500 M Budget

- **2016-2020**: Taita Taveta University of Mining, Business and technology
  - 6,000 students
  - 25 programs
  - 6 campuses
  - 2 Billion Budget

12/22/2017 DAAD Akademie Meeting, Berlin
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
Growing Quality Academic Programs (2017-2022)

School of Mines and Engineering
- BSc Mining and Process Engineering
- BSc Civil and Environmental Engineering
- BSc Petroleum Engineering
- BSc Chemical Engineering
- BSc Applied Geology
- MSc Geophysics
- MSc Mining/Environmental Eng./Relevant PhD
- MSc Process Engineering/Relevant PhD

School of Agriculture, Earth and Environmental Sciences
- BSc Horticulture
- BSc Agriculture
- BSc Environmental Science
- BSc Biodiversity and Wildlife Ecology
- BSc Food Science and Technology
- Relevant MSc and PhD

School of Science and Informatics
- BSc Information technology
- BSc Mathematics and Computer science
- BSc Statistics
- BSc Computer Science
- BSc Analytical Chemistry
- BSc Environmental Chemistry
- MSc Information Technology/Information Systems
- MSc Computer sciences
- MSc Analytical Chemistry
- MSc Environmental Chemistry
- Relevant PhDs

School of Business, Economics and Sociology
- Bachelor of Commerce
- Bachelor of Purchasing and Supplies Management
- Bachelor of Business and IT
- BA Tourism and Hospitality Management
- BA Economics and Finance,
- BA Economic and Statics
- BA Business Administration
- BA Sociology and Community Development
- Relevant MA Programs
- Relevant PhD Programs
- MBA (Natural Resource Management)
- MBA Technology Management
TTU Research Profile

- **Mining and Sustainability**
  - Resource Mapping and quantification
  - Resource characterization-fingerprinting the gemstone and other ores
  - Socio-economic issues related to mining
  - Sustainable Mining
  - Mineral Processing Technologies (e.g., removing impurities from Fluorspar)
- **Basic Sciences**
  - Geosciences
  - Biosciences
  - Environmental and natural product chemistry
  - Mathematics and Computer science
- **Natural Resources**
  - Environment and Biodiversity
  - Cloud Forests including Mwambirwa Forest (Water, Biodiversity, Livelihoods, Sustainability, Conservation)
  - Wild Life Ecology (Animals/Plants)
  - Climate Change
  - Flood Soil Erosion and Voi River and springs
- **Agriculture and Food Security**
  - Crop productivity
  - Crop diversity/Indigenous crops genetic mapping
  - Livestock production
  - Soil-Fertility
  - Plant pathology/Plant Diseases/Biorationals/Biotechnology
- **Micro- and Medium Enterprise**
  - Gemstone Business/Mineral Economics
  - Agribusiness/Bioeconomy
  - Retail
  - Market analysis
  - Emerging businesses
Mining in Kenya

• Mining accounts for 1% of GDP; Has potential for 3.5%
• Mining engineers, survey engineers, and geoscientists are critical to the extractive industry
• The extractive sector is gaining importance in Kenya and the greater East Africa following the discovery of substantial deposits of oil, coal, iron ore, rare earth minerals, and other minerals.
• Kenya has an acute shortage of practising engineers, less than 8,000 for a population of over 40 million – far below the UNESCO-recommended ratio of engineers to national population (1:2,000)
Mining in Kenya

• Kenya has not trained enough human capacity to run the extractive sector, and needs practice-oriented experts to lead the relevant teaching, research and development.

• Mineral resource development is among the 6 priority sectors under the Economic Pillar of Kenya Vision 2030.

• Strong research collaborations with government and industry promise a robust nexus for producing a critical mass of innovative practising experts and researchers.
Centre for mining, environmental engineering and resource management (cemerem)

- One of the 8 Centres of African Excellence
- Located at Taita Taveta University
- Supported by the German Academic Exchange Service (DAAD)
- Undergraduate and postgraduate training
- Hosting the National Mining Institute (NMI)
- A partnership of 3 Universities
  - TTUC-Host
  - HTW Dresden-Lead Partner
  - TU Bergakademie Freiberg, Partner
  - University of Applied Sciences, Zittau-Gorlitz, Partner
# Areas of Focus

<table>
<thead>
<tr>
<th>WP</th>
<th>Description</th>
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<tbody>
<tr>
<td>WP 1</td>
<td>Preparatory work and needs assessment</td>
</tr>
<tr>
<td>WP 2</td>
<td>Curricula review and development</td>
</tr>
<tr>
<td>WP 3</td>
<td>Human resources development and capacity building (MSc and PhD Training)</td>
</tr>
<tr>
<td>WP 4</td>
<td>Implementation of BSc &amp; MSc courses at TTUC</td>
</tr>
<tr>
<td>WP 5</td>
<td>Infrastructure development at TTUC</td>
</tr>
<tr>
<td>WP 6</td>
<td>Networking and capacity building with industry and government</td>
</tr>
<tr>
<td>WP 7</td>
<td>International exchange and research</td>
</tr>
<tr>
<td>WP 8</td>
<td>Management and quality assurance</td>
</tr>
</tbody>
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12/22/2017

DAAD Akademie Meeting, Berlin
New Curricula for the Mining Sector (from 2018)

• Degree Courses
  • BSc Mining and Mineral Processing Engineering
  • MSc Environmental Engineering
  • MSc Mining Engineering
  • MSc Process Engineering
  • MBA Natural Resource Management

• Short Courses
  • Water Resource Management
  • Processing Technologies
  • Geographical Information Systems (GIS)
  • Solid Waste Management and Recycling
  • Renewable Energy

TTY students and staff with the Rektor of HTW Dresden
Working with Government Ministry of Mining

• Imputing into the Mining Law and Mining Policy
• Contributing to strategy paper on iron and steel industry development in Kenya
• Hosting the National Mining Institute
• Contributing the Kenya Mining Forum
• Reviving the Mineral Processing Pilot Plant and Capacity Building of Staff
• Exposure and Education Visits by Government Delegations to Germany
10.39 carat
Price: $59,900.00
Clarity: Eye Clean
Origin: East Africa
Shape: Modified Trillion
Cut: Portuguese
Treatment: Unheated
Size: 14.40 x 14.45 x 7.14 mm
Working with Devolved Governments

- Support in Development of Laws and Policies
- Support in talent search and recruitment of County Staff
- Capacity Building of Staff
- Development of Economic Blue Prints
- Research on County Issues
- Exposure visits to Learn from small towns in Germany (the future)
  - Spatial Planning
  - Waste Management
  - Water Resource Supply and Management
  - Mobility Planning and Management
Addressing the problem of Violent Extremism in Kenya

• Investing in Research based solutions
• Good Governance and the Rule of Law
• Cultural Understanding (Begegnung mit der Fremden)
• Focusing on Returnees: Deradicalisation and Re-integration
• The Impact on Women and Children
• The Role of Civil Society
• The Role of Regional Governments
• Involving Local Communities
• Emphasizing Inclusion
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
Working with Industry

• Internship and attachment for student (Common and widely accepted)
• Industrial attachment for staff (quite rare)
• Research for Industry (a rarity)
• Short Courses for staff and Managers
• Bridging the gap between mining companies and their host communities through independent research and outreach activities
• Working with Artisanal/Small scale Miners
• Linking Industry With Academia (LIWA)
Reconciling livelihood needs and nature conservation in East African forest biodiversity hotspots

- Riparian gallery forests around Kitui - South Eastern Kenya University (SEKU)
- Arabuko Sokoke coastal forest - Pwani University (PU)
- Taita Hill cloud forests - Taita Taveta University (TTUC)

In Partnership with TU Munich
(Prof. Jan Christian Habel)
Supported by DAAD
<table>
<thead>
<tr>
<th>Project</th>
<th>Partners</th>
<th>Funder</th>
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</thead>
<tbody>
<tr>
<td>Voirica- Soil Erosion and Flood Risk Management in Voi Town</td>
<td>TTU, TU Kaiserslautern, FU Berlin, Taita Taveta County</td>
<td>DAAD</td>
</tr>
<tr>
<td>Tsavo River: Participatory water shed Planning for the Tsavo River</td>
<td>TTU, Uni Sigen, WARMA, Taita Taveta and Kajiado Counties, KWS</td>
<td>DAAD</td>
</tr>
<tr>
<td>Biodiversity conservation and livelihood support (Taita Hills, Kitui and Arabuko Sokoke)</td>
<td>TTU, TU Munich, Pwani University, SEKU, KWS KFS</td>
<td>DAAD</td>
</tr>
<tr>
<td>Transform Taita Taveta 2020</td>
<td>TTU and Taita Taveta County Government</td>
<td>TTCG</td>
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<tr>
<td>Working with County and National Governments to Counter Radicalisation and Violent Extremism in the Coast Region</td>
<td>TTU, Pwani University, Counties 001, 002, 003 and 004, NCTC, Civil Society</td>
<td>BHC</td>
</tr>
<tr>
<td>Microbial Diversity of Louis Glacier on Mount Kenya</td>
<td>Japanese Polar Research Institute, TTU</td>
<td>JSPS-NACOSTI</td>
</tr>
<tr>
<td>Microbial diversity in Agro-ecological zones in Africa</td>
<td>TTU, University of Pretoria</td>
<td>USAID</td>
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# Ongoing R&D Projects by TTU

<table>
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<tr>
<th>Project</th>
<th>Partners</th>
<th>Funder</th>
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</thead>
<tbody>
<tr>
<td>Developing County Action Plans to Counter Radicalisation and Violent Extremism</td>
<td>TTU, PU, Lamu, Kilifi, Kwale, Mombasa Counties, Civil Society</td>
<td>BHC</td>
</tr>
<tr>
<td>Working with Imams and Sheikhs to Develop Counter Narratives against Radicalisation and VE</td>
<td>TTU, PU, CIPK, KMDI</td>
<td>BHC</td>
</tr>
<tr>
<td>Short Courses targeting County and National Government -Minerals Processing Technologies</td>
<td>HSZG, TTU, Ministry of Mining</td>
<td>MoM</td>
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<tr>
<td>-Water Resources management</td>
<td>TTU, HTW-Dresden, WRMA, Water Companies, WRUAS</td>
<td>DAAD</td>
</tr>
<tr>
<td>-Renewable Energy</td>
<td>TTU, TU-Freiberg</td>
<td>DAAD</td>
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<tr>
<td>-GIS</td>
<td>TTU, University of Helsinki</td>
<td>Finnish Government</td>
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</table>
The Challenge of Research in Africa

• African researchers produce only 1 percent of the world’s research,

• Between 2003 and 2012, African researchers more than doubled their outputs, producing papers on subjects ranging from HIV, to cancer to climate change to ageing.

• Most research in Africa focuses on agriculture and the health sciences, as the continent is battling serious diseases like HIV/AIDS, malaria, and most recently the Ebola epidemic.

• Research in the physical sciences and in the science, technology, engineering and math (STEM) based fields makes up only 29% of Sub Saharan Africa’s output

• Not able to support sectors like energy, transport, light manufacturing and the extractive industries.

• Yet progress in these sectors could transform Africa’s economies and help end poverty.
The challenge of Research in African Countries

• Weak Management and funding for research
• Unclear Research Agenda/Focus for the Country
• Dependency on intermittent donor funding for research
• Research does not pay the researcher
• Competition from part-time teaching
• The dilemma of Basic Vs Applied or Action Research. International funding that focus heavily on health and agricultural research
• Minimal appreciation of research by political players
• Weak of capacity to turn research output into practice
• A higher education system skewed toward disciplines like the humanities and social sciences.
Challenges Hampering African Universities in fulfilling their mandates

- Politics: Appointments, Policies, Micromanagement
- Governance: Challenges posed by Councils and Chancellors in some cases
- Management Challenges: Conflict between Managers/Capacity/
- Staff Numbers and Quality: Low PhD numbers, few Professors
- Reduced Funding: Stagnant funding for a growing sector
- Inadequate Infrastructure: Admission outstripping facilities
- Low research output: Low funding and unfavorable research environment
- Cohesion: Tribalism/Nepotism influences campus discourse and relationships
- Weak International Links: Low capacity to build International Networks
Growing Excellence within Universities

- Setting up Centres of Excellence in the Region
- Partners in Transformation/Require funding
- Regional Transformation – primarily 6 coastal counties
- A Global Partnership for Sustainable Development

TTUC - Centre for Mining
- Centre for Process Engineering
- GIS and Data Analytics
- Centre for Dryland Agriculture
- Biodiversity/Climate Change

Pwani University
- Institute for Islamic Studies
- Institute for Swahili and Coastal Cultures
- Agriculture
- Marine and Fisheries
- Peace and Conflict/Politics

TUM - Technical and Vocational Training
- Marine Engineering, Maritime and Port studies
- Logistics
President Uhuru Kenyatta while addressing chancellors from public universities in May 2016 said:

“Higher education is growing at an incredible pace. This is not only because of demand but because of the pace of development. We must make sure we maintain a healthy balance between quality and quantity.”

Conclusion

• Kenya and the African continent have a lot to offer the world of Academia
  • Projected Economic Growth
  • Exploding Population
  • Bulging youthful population in need of college education
  • Unexplored and unexploited resources
  • Rich cultural diversity and potential
  • Challenges of poverty, conflict, environmental degradation
  • Rapidly growing cities
  • Challenges of rural development

• Offers opportunity for research and education for Universities and their partners

• German Universities encouraged to reach out to partners in Africa