Science, Technology and Innovation Networking for the Next Generation of Academics

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University of Washington Panel Discussion
Brain Drain, Brain Gain or Brain Circulation:
Doctoral Education and the Global Divide
Seattle, Washington
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BACKGROUND
Recent Comments

• HP could double its sales in Africa if it could find enough skilled workers to install and maintain all the equipment it can sell
• Help us get rid of low paying jobs and replace them with high paying jobs
• Mauritius can either export its children or it can export globally competitive, high value added goods and services
Two Roads

Ignorance
Unskilled labor
Low-value-products
Low-wage jobs
Dead-end

Knowledge
Skilled workforce
High-value products
High-paying jobs
Competitiveness
Why Worry About All This?

Knowledge makes the Difference between Poverty and Wealth...

Thousands of constant 1995 US dollars

Difference attributed to knowledge

Difference due to physical and human capital
Difference Attributable to Knowledge

• What kind of knowledge?
• Where do you get it?
• How do you find it?
• How do you learn to use it?
Dimensions of STI Capacity

- Import, adapt, and adopt knowledge produced outside the country
- Produce and use new knowledge via R&D
- National (and local) government capacity to formulate and implement coherent S&T programs and policies
- Technologically and scientifically skilled workforce trained to work with modern equipment and production processes
- Enterprise capacity to utilize knowledge to innovate and produce higher value added, globally competitive goods and services
- Education, vocational training, and R&D institutes
The Pieces Must Fit Together

STI

PSD

Education and Skill Development
Capacity building is needed at all skill levels

Skill Levels

- Basic Operators Skills and Capabilities
- Technician & Craft Skills & Capabilities
- Design & Engineering
- R&D

Required Tasks

- Hydrological Analysis of Surface and Underground Water
- Watershed Conservation and Pollution Control
- Well Boring and Pumping Underground Water
- Harvesting Rainwater Run-offs from Roofs and Fields
- Water Storage & Distribution Infrastructure
- Water Purification and Water Quality Control

Required Skills

- Hydrology, Geology, Limnology, Geochemistry, GIS and Remote Sensing
- Environmental Engineering, Chemistry, Soil Science, Geology
- groundwater engineering, Construction, Masonry, Pump operation, maintenance
- Geology and Hydrology, Construction and Masonry
- Civil Engineering; Construction, masonry (for tanks, reservoirs, pipes)
- Chemistry, Microbiology, Public Health, Environmental Science, Laboratory Assistance
Getting the Balance Right is Important!
NETWORKING ISSUES
Conundrum

- Science and education faculties are aging rapidly and large numbers of retirements are inevitable in the next five years;
- There are large numbers of vacant positions in science and engineering faculties across Africa;
- The ranks of younger professors are too small to meet the expected wave of retirements; and
- Higher education enrollments are growing rapidly. Faculties must expand to meet this growing demand, but they are barely able to maintain the status quo.
- Skill shortages, but graduates can’t find jobs
## Tertiary Education Enrollment (000’s)

<table>
<thead>
<tr>
<th>Country</th>
<th>1999</th>
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<tr>
<td>Botswana</td>
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<td>Ethiopia</td>
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<td>Mauritius</td>
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<tr>
<td>Tanzania</td>
<td>19</td>
<td>51</td>
</tr>
<tr>
<td>Uganda</td>
<td>41</td>
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</tr>
</tbody>
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Faculty Vacancies

- **Makerere:** As of August 2007, 1,052 of 1,796 faculty positions were filled; 666 had PhD’s; 554 more needed to fulfill staffing levels.

- **UDSM:** For first time, teaching positions were being filled in 2007 by staff with only a bachelor’s degree – 128 of 512.

- **Kenyatta:** Of 730 academic staff, only 31 full professors and 48 associate professors.

- **University of Nairobi:** Because of staff shortages, graduate students in physics are being offered tenure in return for teaching duties.

- **Ghana:** About 40% of faculty positions in universities and 60% in polytechnics are vacant.

- **Nigeria:** An estimated two-thirds of the 36,000 faculty positions are vacant.
Aging Faculty

- Kenyatta: Of 31 full professors, 28 are over age 50.
- Kyambogo (Uganda): Of 417 academic staff, only 22 have PhDs; 9 of them are past mandatory retirement age.
- UDSM: In May 2006, of 512 academic staff, none were under 30, 8 were between 31 and 35, and only 12% were under 40.
- Nigeria: 400 professors — 45 percent of the top-level professoriate — reach mandatory retirement age in 2008
Brain Drain

• In 1990, nearly 7,000 Kenyans with tertiary education migrated to US.
• A 2003 estimate: at least 10,000 Nigerian academics and 21,000 Nigerian doctors were in the US alone.
• Movement of academics to wealthier countries within Africa.
• Movement of academics to better-paying jobs in government or private sectors.
Governance Issues

• Low wages, generally tied to civil service pay scales, and poor faculty working conditions act as a disincentive for well-trained African scientists to work in African universities, especially when they can get much better pay and working conditions by working elsewhere.

• Universities do not have sufficient autonomy to set their own agenda, recruit faculty, set pay scales based on merit, etc. Filling faculty vacancies has to compete with other budget needs.

• Universities cannot charge fees or generate outside income (via research grants) to supplement their budget allocations from the Ministry of Finance.
Factors in Leaving Academia

“Push” Factors

- Low remuneration
- Lack of professional development & support
- Slow promotion process
- Lack of equipment, books & libraries
- Heavy undergrad teaching load
- Lack of housing

“Pull” Factors

- Low status of academia
- Better remuneration in private & civil sectors
- Overseas opportunities
- Opportunities in wealthier African countries
- Overseas training increases threat of brain drain
Network Programs, Needs, and Resources

World Bank/ADB/NORAD
STI Capacity Building Programs

Developing Country STI Capacity Building Needs

OECD Capacity Building Resources
Network Objectives

Training Africans (In Africa? In network partner institutions?)

Joint R&D Programs

Technology Diffusion

Building Faculty Capacity at African Universities
Rationale for Regional Networks of Universities

• Most universities in Africa have limited faculty capacity – but where capacity for comprehensive training does not exist in single institutions, it may exist regionally.

• Institutions cannot afford expensive instrumentation – but universities could reap economies of scale by sharing equipment.

• Regional networks can create a critical mass of faculty and students.

• Networks can link researchers who are isolated professionally and geographically.
Carnegie-IAS African Regional Initiative in Science and Education (RISE)

- **RISE** will prepare PhD-level scientists and engineers in sub-Saharan Africa through university-based research and training networks in selected areas.

- Medium-term goal: Produce new faculty and upgrade qualifications of existing faculty.

- Long-term goal: Develop capacity of African universities to train and retain succeeding generations of faculty.
About RISE

• Will support three competitively selected research and training networks, each comprising universities in at least three different countries in sub-Saharan Africa.

• Each RISE network will grant at least 15 PhD and Masters degrees over 4-6 years.

• Each network will receive funding of approximately US$800,000 over 2 ½ years; follow-up funding likely.

• Retention strategy critical.
Selection Criteria

- Scientific merit
- Training capacity
- Research activities
- Evidence of institutional support
- Added value of the network versus separate support to individual institutions
- Potential for sustainability
- Strategy to attract/retain female faculty and students
- Strategy to retain RISE graduates at universities in the region
Resources

• RISE  http://www.msi-sig.org/rise.html
• State Department Summit: Higher Education for Global Development  http://www.hedglobalsummit.org/
• ADB HEST Strategy  (i) strengthening national and regional [higher education] centers of excellence; (ii) building or rehabilitating science, technology and higher education infrastructure; and (iii) linking higher education, science and technology to the productive sectors.
   http://www.afdb.org/pls/portal/docs/PAGE/ADB_ADMIN_PG/DOCUMENTS/STRATEGYDOCUMENTS/STRATEGY%20FOR%20HIGHER%20EDUCATION%20SCIENCE%20AND%20TECHNOLOGY.PDF
• MASDAR Institute of Science and Technology
Building Science, Technology, and Innovation Capacity in Rwanda

Developing Practical Solutions to Practical Problems

Alfred Watkins and Anubha Verma, Editors

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Capacity Building for Sustainable Growth and Poverty Reduction

Alfred Watkins and Michael Ehat, Editors

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THANK YOU

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