

# **ATTRACTING PUBLIC AND PRIVATE SECTOR FUNDING TO SUPPORT SCIENCE AND TECHNOLOGY CENTERS OF EXCELLENCE IN AFRICA**

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# ECONOMIC RATIONALE FOR GOVERNMENT SUPPORT OF R&D

- R&D produces technology to enhance productivity, profitability, sustainability.
- Technological progress is a key determinant of economic growth.
- Benefits of R&D spill over to other sectors of the economy.
- R&D generate positive rates of return.

# **RATE OF RETURN ON RESEARCH AND DEVELOPMENT (R&D)**

## **PRIVATE:**

- Firm's decision to invest in R&D based on private return to R&D.
- Private returns to R&D: 10% to 15% or higher.

## **SOCIAL RETURN:**

- Due to “spill over” effect: Social return to R&D about 40% or more.
- High social rate of return justifies government subsidies to R&D.

# RESEARCH AND DEVELOPMENT EXPENDITURE AS A PERCENTAGE OF GDP

<u>Country/Region</u>	<u>% RD &amp; GDP</u>
Japan	3.35%
US	3.08%
Germany	2.52%
France	2.2%
UK	1.87%
China	1.44%
South Africa	.87%
Africa (Continent)	.3%

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Source: UNESCO Reports

# CENTERS OF EXCELLENCE IN AFRICA

## Rationale:

- (1) Africa's need for capacity in science, technology, and innovation.
- (2) Capacity Building in Science and Technology: "Imperative" for the continent.
- (3) Science, technology, innovation to be "embedded" in national development strategies.
- (4) Africa's economic renewal/sustainable development linked to effective research and development institutions.

# APPROACHES TO CENTERS OF EXCELLENCE

## New Partnership for Africa's Development (NEPAD):

- Build networks of “Centers of Excellence for cross-border staff exchanges and training.”
- Address shared or common R&D challenges and priorities.
- Achieving excellence in science and technological activities is a knowledge-based, intensive progress.
- Nations need to have clear indicators, benchmarks to determine if R&D institutions are moving to excellence status.
- Centers of Excellence to have clear objectives consistent with regional sustainable development goals.

# APPROACHES TO CENTERS OF EXCELLENCE

## EUROPEAN UNION – G8 NATIONS:

- Build African institutes of science and technology to develop capacity.
- “Embed” science, technology, innovation in developmental strategies.
- Develop “Service and Technology Networks of Excellence.”
- Partner African centers with counterparts in developed countries.
- Pledge \$5 Billion over 10 years for African universities.

# APPROACHES TO CENTERS OF EXCELLENCE

## **SOUTH AFRICA:**

Six Centers of Excellence launched in April 2005 by National Research Foundation

## **GOALS OF CENTERS:**

1. Generate new knowledge.
2. Provide access to highly developed knowledge.
3. Maintain data bases.
4. Promote knowledge sharing and transfer.
5. Negotiate partnerships.

## **THE NEW CENTERS (all linked to universities):**

- Biomedical TB Research
- Invasion biology
- Strong materials
- Birds as keys to biodiversity
- Catalysis
- Tree health biotechnology

# APPROACHES TO CENTERS OF EXCELLENCE

## American Colleges and Universities

<u>Funding Sources:</u>	\$ (Millions)	% Share	
Federal Government	24,734	6%	
State and Local Government	2,653	7%	
Industry	2,162	6%	
Institutional Funds	7,683	19%	
Other Sources	<u>2,845</u>	<u>7%</u>	
<hr/>	Total	\$40,077	100%

Source: National Science Foundation

## R&D EXPENDITURES BY FIELD IN FY 2003

Agriculture Sciences	6.3%
Biological Sciences	18.4%
Computer Sciences	3.2%
Environmental Sciences	5.4%
Mathematical Sciences	.1%
Physical Sciences	32%
Psychology	8.1%
Social Sciences	4%
Engineering	15%

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Source: National Science Foundation

# **Building Capacity for Science and Technology in Africa:**

A proposal from the Diaspora to enhance human capacity.

A proposed role for America's Historically Black Colleges and Universities.

# Ongoing HBCU Linkages in Africa

Institution	S & T Activities in Africa
Clark-Atlanta University	Technical assistance in Egypt, Madagascar, Togo, Zaire
Central State University	Senegal (water management)
Howard University	Malawi (health research)
Florida A&M, Alabama A&M	Cameroon, Zambia (agricultural research)
Jackson State University	South Africa (AIDS/HIV Research)
Langston University	Ethiopia (goat production)
Tuskegee University	Egypt (water purification)
Mississippi Consortium (includes HBCUs)	Mauritius (information technology)
Wilberforce University	Nigeria (meat processing)
Florida Memorial University	Niger (information technology)
Florida A & M University	Tanzania (information technology)

Source: Frierson (1995); and UNCF-SP

## **HBCU Productivity in Science and Technology Disciplines**

- Seven of the eleven top eleven universities that produce African American engineers are HBCUs.
- Eight of the top ten colleges that graduate African American scientists are HBCUs.
- Eight of the top eleven producers of African American baccalaureates in agriculture, agricultural operations and related sciences were HBCUs.
- Sixteen of the top 21 producers of African American baccalaureates in biological and biomedical sciences were HBCUS.
- The top twelve producers of African American baccalaureates in physical sciences are HBCUs.

## HBCUs Graduate School Productivity in STEM Disciplines

Discipline	Number of HBCUs Ranked Among Top 10 Producers	
	Masters Degree	Doctorate Degree
Agriculture and Related Sciences	3	--
Biological and Biomedical Sciences	4	4
Computer and Information Sciences	2	--
Engineering	2	3
Health Professions and Clinical Sciences		3
Mathematics and Statistics	5	--
Physical Sciences	6	1

Source: Black Issues in Higher Education

# **BUILDING HUMAN CAPACITY IN STEM DISCIPLINES: AN HBCU PROPOSAL**

- Summit between African Union, African Universities, America's HBCUs.
- Creation of a Diaspora STEM consortium: AU, AAU, HBCUs
- HBCUs commit to admissions slots for STEM majors from Africa.
- A Built-in 5% annual growth rate.
- 94 HBCUs offer 4-year degree programs in the STEM disciplines.
- Over 10 years: almost 30,000 new African scientists with undergraduate degrees.

# Foreign Student Enrollment in American Universities

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<b>Year</b>	<b>Total Foreign Student Enrollment</b>	<b>Total African Student Enrollment</b>
1996-97	453,787	20,874
1998-99	490,933	26,019
2003-2004	572,509	40,648

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Source: The Chronicles of Higher Education

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# Projected HBCU Diaspora STEM Initiative Enrollment

Year	Total African Students in USA	Normal Science & Technology Enrollment	HBCUs African STEM Enrollment
2004	40,648	24,673	2,467
2006	41,867	25,414	2,541
2007	43,123	26,176	2,618
2008	44,417	26,961	2,696
2009	45,750	27,770	2,777
2010	47,122	28,603	2,860
2011	48,536	29,461	2,946
2012	49,992	30,345	3,035
2013	51,492	31,255	3,126
2014	53,036	32,193	3,219
2015	54,628	33,159	3,31

Note: Normal enrollment is exclusive of the HBCU STEM initiative

# SUPPORTING THE DIASPORA INITIATIVE

Sources	Present Support	Proposed Support
Colleges/Universities	20%	40%
International Donors	3%	20%
Home Government	3%	30%
Student's Family	74%	10%