INTERNATIONAL TECHNOLOGY TRANSFER: HIGH-LEVEL PERSPECTIVE FROM DEVELOPING COUNTRIES
- Keynote 2 -

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WIPO Expert Forum on International Technology Transfer
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Developing Countries in Context
R&D – not primary source of innovation in Africa

World of R&D 2011
Size of circle reflects the relative amount of annual R&D spending by the country noted.

Source: Battelle, R&D Magazine, International Monetary Fund, World Bank, CIA World Factbook, OECD
Figure 2: Global R&D Investment Map

Figure 3: Global Researchers Map
Transitioning to Knowledge Economy: The case of Africa
Global R&D and Research capacity Landscape (2011)

The fast-growing continent
Projected real GDP growth rates, 2014 and 2015

Source: International Monetary Fund
Transitioning to Knowledge Economy: The case of Africa

Africa’s Attractiveness as an Investment Destination

Africa’s relative attractiveness is on the rise

Relative to the following markets, is Africa more or less attractive as an investment destination?

<table>
<thead>
<tr>
<th>Year</th>
<th>Markets more attractive than Africa</th>
<th>Markets less attractive than Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1. Asia (+31)</td>
<td>9. Central America (-4)</td>
</tr>
<tr>
<td></td>
<td>2. North America (+16)</td>
<td>10. CIS (-19)</td>
</tr>
<tr>
<td></td>
<td>3. Western Europe (+15)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Middle East (+8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Oceania (+6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Latin America (+2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Eastern Europe (0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Africa (0)</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>1. Asia (+26)</td>
<td>9. Central America (-5)</td>
</tr>
<tr>
<td></td>
<td>2. North America (+13)</td>
<td>10. CIS (-17)</td>
</tr>
<tr>
<td></td>
<td>3. Oceania (+5)</td>
<td></td>
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<tr>
<td></td>
<td>4. Western Europe (+5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Africa (0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Middle East (-0.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Latin America (-1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Eastern Europe (-3)</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>1. Asia (+16)</td>
<td>9. Central America (-5)</td>
</tr>
<tr>
<td></td>
<td>2. Oceania (+11)</td>
<td>10. CIS (-17)</td>
</tr>
<tr>
<td></td>
<td>3. Latin America (+8)</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td></td>
<td>5. Africa (0)</td>
<td></td>
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<tr>
<td></td>
<td>6. Central America (-1)</td>
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<td></td>
<td>7. Western Europe (-4)</td>
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<tr>
<td></td>
<td>8. Middle East (-10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Eastern Europe (-12)</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>1. North America (+4)</td>
<td>9. Central America (-19)</td>
</tr>
<tr>
<td></td>
<td>2. Africa</td>
<td>10. CIS (-14)</td>
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<tr>
<td></td>
<td>3. Asia</td>
<td>5. Latin America (-14)</td>
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<tr>
<td></td>
<td>4. Oceania (-2)</td>
<td>6. Middle East (-15)</td>
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<td>5. Western Europe (-3)</td>
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<td>6. Middle East (-15)</td>
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<tr>
<td></td>
<td>7. Latin America (+1)</td>
<td></td>
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<tr>
<td></td>
<td>8. Eastern Europe (-17)</td>
<td></td>
</tr>
</tbody>
</table>


Source: FDI Intelligence.
# Transitioning to Knowledge Economy: The case of Africa

Investors per sector in FDI Projects in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Investors</th>
<th>Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>UK, South Africa, US</td>
<td>Financial services, TMT, RCP</td>
</tr>
<tr>
<td>Kenya</td>
<td>US, UK, India</td>
<td>TMT, financial services, RCP</td>
</tr>
<tr>
<td>Mozambique</td>
<td>UK, South Africa, Portugal</td>
<td>RCP, coal, oil and natural gas, RHC</td>
</tr>
<tr>
<td>Zambia</td>
<td>South Africa, China, India</td>
<td>Financial services, metals and mining, RCP</td>
</tr>
<tr>
<td>Tanzania</td>
<td>UK, Kenya, India</td>
<td>Financial services, TMT, RCP</td>
</tr>
<tr>
<td>Uganda</td>
<td>Kenya, UK, India</td>
<td>Financial services, RCP, TMT</td>
</tr>
<tr>
<td>Nigeria</td>
<td>US, South Africa, UK</td>
<td>TMT, RCP, financial services</td>
</tr>
<tr>
<td>Rwanda</td>
<td>Kenya, Uganda, US</td>
<td>Financial services, TMT, RHC</td>
</tr>
</tbody>
</table>

Source: fDi Intelligence.
### Transitioning to Knowledge Economy: The case of Africa

#### Knowledge Generation: Patent Applications Per region

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of applications</th>
<th>Resident share (%)</th>
<th>Share of world total (%)</th>
<th>Average growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1,490,300</td>
<td>2,567,900</td>
<td>62.5</td>
<td>66.5</td>
</tr>
<tr>
<td>Africa</td>
<td>9,200</td>
<td>14,900</td>
<td>18.5</td>
<td>15.4</td>
</tr>
<tr>
<td>Asia</td>
<td>705,600</td>
<td>1,500,400</td>
<td>74.3</td>
<td>78.8</td>
</tr>
<tr>
<td>Europe</td>
<td>324,500</td>
<td>346,400</td>
<td>62.2</td>
<td>63.3</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>42,800</td>
<td>63,300</td>
<td>13.8</td>
<td>12.2</td>
</tr>
<tr>
<td>North America</td>
<td>379,700</td>
<td>606,300</td>
<td>50.8</td>
<td>48.2</td>
</tr>
<tr>
<td>Oceania</td>
<td>28,500</td>
<td>36,600</td>
<td>15.1</td>
<td>12.8</td>
</tr>
</tbody>
</table>

Note: WIPO estimates cover 139 offices and include the following number of offices: Africa (24), Asia (41), Europe (44), Latin America & the Caribbean (23), North America (2) and Oceania (5).

Source: WIPO statistics database, October 2014.
Transitioning to Knowledge Economy: The case of Africa
Lessons from South Korea

“The intellectual property system was an important catalyst for the development of indigenous technology by Korean companies, several of which have become global market leaders. Korea’s spectacular transformation from a poor farming economy in the 1960s with a per capita income of less than US $100 to a highly industrialized country with a per capita income of US $12,000 today, resulted from a systematic economic and trade development policy that included incentives for technological innovation and the development of domestic intellectual property assets.”

Chulsu Kim, Integrating Intellectual Property into the National Development Policy: the Korean Experience, keynote address at WIPO/ KIPO Ministerial Conference on Intellectual Property for Least Developed Countries
>1 billion people, 50% under the age of 25

- Critical mass of STI human resources and skills

- AU Agenda 2063
  - “access to technology, opportunities and capital and concerted strategies to combat youth unemployment and underemployment” as being critical propelling the continent’s political, social, cultural and economic transformation Ibid., paragraph 67(h)

- African Union Science, Technology and Innovation Strategy for Africa (STISA-2024)
  - Building and/or upgrading research infrastructure;
  - Enhancing professional and technical competencies;
  - Promoting entrepreneurship and innovation; and
  - Providing an enabling environment for STI development in the African continent
Specific Comments on Technology Transfer
Focus Areas and Informal Channels

- Specific focus on development of local technological base and capabilities through technology transfer:
  - Building relevant STI human capital
  - Expanding Innovation System
  - Developing a balanced IP System

- Importance of informal channels for technology transfer
  - Conferences and workshops
  - Research collaborations and networks
  - Networks - people do business with people
Specific Comments on Technology Transfer
Addressing the human capital deficit

- Prerequisite for successful technology transfer
- Poor education infrastructure / R&D investment

Strengthening human capital
- Increase R&D investment
- Focus on both research and innovation enabling skills
- Joint research programmes
- Exchange programmes (post-doctoral fellows, secondment of expert personnel, joint appointments, scholarship programmes)
- Joint supervision of post-graduate students
Addressing the human capital deficit

Examples:

- European Union - Framework 7 / Horizon 2020
- Emory-South Africa Drug Discovery Programme (2008)
- International Science Promoting Innovation and Entrepreneurship (INSPIRE) – comprehensive scholarship programme – innovation and entrepreneurship
- Hydrogen South Africa (HySA) Centres of Excellence Programme
- Graduate development programmes outside home country (Botswana)
- Gauteng Accelerator Programme in Biosciences - Emory and Pfizer collaboration
Addressing the human capital deficit

Educating entrepreneurs in South Africa: Emory partners to offer Gauteng Accelerator Programme

Woodruff Health Sciences Center | March 16, 2012

Emory University and The Innovation Hub, Africa’s first internationally accredited science park located in Gauteng Province in South Africa, this week launched the Gauteng Accelerator Programme (GAP) in Biosciences with a two-day bioscience business workshop for South African scientists and entrepreneurs.

Emory’s involvement in GAP Biosciences is part of a larger effort by Emory to assist in building bioscience capabilities in South Africa.

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Specific Comments on Technology Transfer
Expanding the National Systems of Innovation

- Critical mass of STI human capital a prerequisite
- Building a bridge between R&D and the market (increased focus on commercialisation)
- Right mix of institutional arrangements
- Appropriate funding instruments and incentives
- Expand on the local private sector – focus on entrepreneurship
Expanding the National Systems of Innovation: South Africa

Higher Education Act, 1997 establishing 23 higher education institutions some from merger of pre-1994 universities and technikons

Public Research Institutes (e.g. CSIR, Mintek, ARC, MRC, etc.)

Three Spheres of Government and related agencies

Private Sector

Entrepreneurs, inventors and society
Expanding the National Systems of Innovation: South Africa – the Funding Challenge

The Missing Middle

Critical Overlap

THRIP

NRF / SETI Core

TIA Support

IDC / SPII / NEF

Regional Based (e.g. GEP, ECDC, etc)

Private Equity

“Early Stage”

“Intermediate VC”

“Classic VC”

Risk Profile

IP Value

Innovation Chain

Basic Research

Applied Research

Tech Development

Manufacturing

Performers

Universities

Science Councils

Industry

Adapted from DST, 2012
Expanding the National Systems of Innovation
Example: South Africa Technology Stations Programme

- Tshumisano Trust, Department of Science and Technology
- Strengthen and accelerate interaction between Universities of Technology and Small Medium Enterprises (SMEs)
- Technology Stations Services:
  - Technical support to SMEs – technology solutions, services and training
  - Adaptations and prototypes
Specific Comments on Technology Transfer
Developing Balanced IP Systems

- TRIPS Agreement an important framework for appropriate IP Systems aligned to stage of development

- Effective use of TRIPS flexibilities to support development of a technological base
  - Research exemption
  - Bolar provisions
  - Best mode
  - Utility models / petty patents

- Policy development

- Trade Agreements

- Right balance
  - Attract FDI
  - Incentivise use, adaptation, and endogenous innovation
**Specific Examples of Technology Transfer**

Emory University (USA) - iThemba Pharmaceuticals (South Africa)

**Licensed Patents / know-how:**
- Synthesis method for Abacavir
- Novel compounds for treatment of latent TB infections

**Scientific Advisory Board**
(top class researchers in USA, UK and SA institutions)

iThemba Pharmaceuticals

Emory University (USA)

TIA (SA Government Fund)
Technology transfer partnerships with Sanofi Pasteur and Biofarma in the area of vaccines
Specific Examples of Technology Transfer
Cuban Heber Biotec – Biovac Institute (South Africa)
Specific Examples of Technology Transfer

- PPP – transfer, development, production and distribution of technology to smallholder farmers in Sub-Saharan Africa – Nairobi (Kenya)
- Addressing food security and climate change
- > 30 technologies accessed (US$180m)
- Majority accessed have since been developed and adapted in Africa
- Manages > 20 technology licenses
Specific Examples of Technology Transfer
South African Motor Industry development Programme (MIDP) - 1995

- Pre-1994 auto-sector
- Improve industry’s international competitiveness
- Encourage growth in vehicles and components manufacture
- Exports and stabilise employment
- Incentive for auto sector to offset import tariffs with export credits
- Transfer of skills to locals
- Expansion of supplier base
Specific Examples of Technology Transfer
Pharmaceutical Sector: Aspen Pharma (South Africa)

**Multinational patent holders**
(incl. GSK, Boehringer Ingelheim)

- Voluntary licences
  - Technology transfer
  - Low cost producer

- US$3b pharmaceutical manufacture facility
- Strategic Investment Programme (SIP)
- Access to market

Aspen Pharma (South Africa)

**Sub-Saharan Africa as Share of Global HIV Prevalence, Incidence, and Deaths Compared to Share of World Population, 2011**

- **World Population**
  - Total: 7.0 billion

- **People Living with HIV**
  - sub-Saharan Africa: 34.0 million
  - All Other Regions: 69%

- **New HIV Infections**
  - sub-Saharan Africa: 2.5 million
  - All Other Regions: 68%

- **AIDS Deaths**
  - sub-Saharan Africa: 1.7 million
  - All Other Regions: 71%

Specific Examples of Technology Transfer
Gautrain – Mass rapid Transit Railway System (South Africa): Government Procurement Driving Technology Transfer

- Bombardier Transportation's Electrostar
- Fifteen cars were manufactured and were assembled by Bombardier in Derby, UK
- Remaining cars assembled in South Africa by UCW Partnership (Union Carriage & Wagon Co. (Pty) Ltd) using structural components made in Britain
- Future manufacture in South Africa.
Specific Examples of Technology Transfer
Creating and Leveraging Intellectual Property in developing Countries (CLIPDC)

Southern Sun Elangeni Hotel, Durban,
November 17-20, 2013

A Power Tool for Social and Economic Growth

Join more than 30 Key and Global IP Leaders in an open forum discussion on how to motivate domestic inventions to spur economic and social growth.
Specific Examples of Technology Transfer
Chinese Shoemaker Huajian Manufactures in Ethiopia (Jan 2012)

- Ethiopian climatic conditions and cheaper labour
- Opened factory in January 2012 (Addis Ababa) and now employ >600 people
- By 2022 will have created > 100,000 jobs
- Local employment and skills transfer / upgrade

Chinese firm steps up investment in Ethiopia with 'shoe city'

Shoemaker Huajian says new $2bn manufacturing zone will transfer skills to locals so they can become the future managers
Concluding Remarks

- Barriers to transfer of technology:
  - Poor understanding and value of IP system
  - Low supply of high-end skills beyond commodity orientation
  - Low R&D investment
  - Absence of active local private sector (dominance of MNCs)

- Efforts must be placed in:
  - Addressing STI human capital deficit
  - Increased R&D investment
  - Balanced IP systems aligned to development priorities
  - Relevant institutions and institutional frameworks (enabling systems of innovation)

- Government incentives, including procurement as a lever for transfer of technology and capacity building
Thank You