WATER – ENERGY – THE ENVIRONMENT – CIVIL ENGINEERING

Training and technology transfer: the engines of eco-innovation and entrepreneurship in Africa

2iE – an African tool for eco-innovation?

Eco-innovation – an engine for growth for 2iE?

OECD 4 and 5 November

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DG of the 2iE Foundation
Training and technology transfer: the engines of eco-innovation in Africa

Factors in successful eco-innovation

Adaptation to market needs

Entrepreneurial capabilities

Adaptation of skills

Expected outcomes

- Economic development of the private sector
- Creation of eco-enterprises in Africa in the form of VSEs and SMEs
- Creation of skilled and unskilled jobs.
Global breakdown of the eco-activities market

• Global market worth $550 billion in 2004

• Estimated growth rate of 30% by 2010

Source: DTI - STUDY OF EMERGING MARKETS IN THE ENVIRONMENTAL INDUSTRIES SECTOR – Nov 2006
Adapting skills: Training and technology transfer

**WATER:**
- Integrated management of water resources in developing countries
- Wastewater disposal systems in urban areas
- Management of water supply and distribution networks, etc.

**Renewable energies:**
- Ability to exploit energy sources (solar, biomass, wind, hydropower, etc.)
- Management and maintenance of energy production facilities
- Design and sizing of facilities, etc.

**Waste:**
- Waste management according to type and impact (health, ecosystems)
- Technical knowledge of recycling and recovery systems, etc.
Joint sciences academies’ statement:

Science and technology for African development

“Without embedding science, technology and innovation in development we fear that ambitions for Africa will fail.”
2iE – an African tool serving eco-innovation?
2iE: an international centre of excellence

- Centre of excellence for water and the environment (UEMOA, ECOWAS, NEPAD)
- Associate member of the Conférence française des Grandes Écoles (CGE)
- Degrees accredited by the CTI (EUR-ACE) – engineering degree recognised in the European area
- Winner of the Grand Prize awarded by the Suez Environnement – Water for All Foundation in 2009
2iE: root and branch reform of the establishment’s operations since 2005

- 2 main focuses: training and research
- Adoption of the international three cycle system
- Teaching curricula designed to meet the economic requirements of the African continent
- Course programmes tailored to meet the requirements of firms in 4 sectors of activity relating to African economic development: water, the environment, energy and civil engineering
- Open and distance learning (ODL)

Guaranteeing jobs for graduates
Water, ecosystem remediation and health

Hydrology and water resources

Biomass energy and biofuels

Solar energy and energy savings

Eco-materials
Courses that guarantee jobs for students

<table>
<thead>
<tr>
<th>Success rate of 2iE students in finding work</th>
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<tbody>
<tr>
<td>Year of graduation</td>
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<tr>
<td>3 months after graduation</td>
</tr>
<tr>
<td>6 months after graduation</td>
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<tr>
<td>12 months after graduation</td>
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Source: 2iE Enquête Ingénieur 2009
For the same degree at the same level, four Africans can study in Africa for the price of sending one African to study in Europe

* Study in Europe → Less than 40% return to Africa
* Study at 2iE → Over 95% find work in Africa

<table>
<thead>
<tr>
<th>Annual cost of training an engineer</th>
<th>Annual course fees</th>
<th>Maintenance</th>
<th>TOTAL</th>
</tr>
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<tbody>
<tr>
<td>Comparable engineering school in France</td>
<td>13 220</td>
<td>13 200</td>
<td>26 420</td>
</tr>
<tr>
<td>2iE (2008/2009)</td>
<td>6 100</td>
<td>1 500</td>
<td>7 600</td>
</tr>
</tbody>
</table>
Business Open Days – 2009

- 120 firms on campus
- 20 student business plans selected, of which 5 were awarded prizes
- Meetings with firms from the power generation and mining sectors to assess their needs
- Demonstration of students’ know-how to firms

Launching of an Executive MBA in 2010
Research aimed at the challenges facing Africa and the rest of the world

Research targeting the years 2030-2050

“everything other than oil”

Conducted within a dense international network of over 40 partners on 5 continents.

1 Unit for the application of scientific and technological information

4 Teaching and research subject units with 7 research laboratories

- Water management and recovery and sewerage systems
  - Pollution monitoring and wastewater treatment processes laboratory
  - Water and hydro-agricultural development laboratory
- Energy and industrial engineering
  - Biomass, energy and biofuels laboratory
  - Solar energy and energy savings laboratory (LESEE)
- Infrastructure and materials science
- Management sciences and sustainable development
  - Transdisciplinary platform for research into complex systems
  - The environment and eco-health approach
Some of 2iE’s achievements in eco-innovation

1. Conversion of diesel engines to run on vegetable oil
2. Ethyl esterification of vegetable oil to produce biofuel
3. Wastewater treatment using aquatic plants
4. Thermal or photovoltaic conversion of solar energy
5. Characterisation of West African biomasses
6. CDM opportunities for biomass energy projects in Africa
7. Optimisation of the sizing of biomass energy processes for agro-food processing units (cashews, mangoes, shea nuts, sesame, kitchens, etc.)
Example of new technology for eco-innovation

⇒ Biomass biofuel
Example of new technology for eco-innovation

⇒ Biomass biofuel
Example of new technology for eco-innovation

- Flexi-energy pilot project

**Access to energy in rural areas**: coupling of several energy sources (in particular solar, diesel and biofuels) in order to increase/secure access to energy, reduce consumption of diesel fuel in generator sets, and in the short term eliminate the use of fossil fuels.
Example of new technology for eco-innovation

- **Biomass/biofuel/solar: flexi-energy**

  **PHASE 1:** Substitution of 35% of generating capacity of the thermal power plant by PV solar power

  **PHASE 2:** Substitution of 5% (of the 65% generating capacity of the fossil-fired plant) by biofuels

  **PHASE 3:** Substitution of 100% of fossil fuels by biofuels. Full control of biofuel-based processes

  **PHASE 4:** A renewable and cheaper energy source for rural areas, easier access for impoverished populations
Example of new technology for eco-innovation

- Biomass/biofuels/solar: flexi-energy
Example of new technology for eco-innovation

- **Compressed earth block (CEB)**

  Developed by the ecological building materials laboratory.

  Cement is expensive in Africa (due to high energy costs). Research conducted since 1990 has made it possible to stabilise soil with an 8-12% mix of cement to produce CEBs - a very cheap material offering a temperature gain of 3-7°C.

  CEBs are currently being used to build extensions to 2iE’s facilities.
2 examples of new technology for eco-innovation

⇒ Compressed earth block: CEB
2 examples of new technology for eco-innovation

- Compressed earth block: CEB
2 examples of new technology for eco-innovation

⇒ Compressed earth block: CEB
2 examples of new technology for eco-innovation

⇒ Eco-materials
Thank you for your attention

Find out more at:

www.2ie-edu.org
Economic growth is both necessary and indispensable to reduce poverty

30% of the papers submitted by 77 economist who took part in “Ideas for growth – Ed. Economia” stated that training fostered growth.

Vocational training and university education are essential for social progress and must be taken into account in the long run.

The African paradox

The precipitous decline since the 1990s in investment by public authorities in the education sector, and in higher education in particular, has fuelled a brain drain and discouraged any thoughts students might have of returning.

This has prompted a reappraisal of education models and the role of the State.
A strong correlation between KEI and GDP/Capita
Knowledge makes the Difference between Poverty and Wealth...

Thousands of constant 1995 US dollars

GDP/Capita Growth: Korea vs Ghana

Rep. of Korea

Difference attributed to knowledge

Ghana

Difference due to physical and human capital
Figure I.8: Unit Expenditure in Public Higher Education Fell in the Majority of Francophone African Countries between 1990 and 2003

Source: Appendix table B1.
Note: GDP = gross domestic product.
The brain drain is real ➔ and is a consequence of inappropriate public and co-operation policies

Did you know that:

1960-1975: 27 000 Africans left the continent to work in industrialised countries

1975-1984: that number reached 40 000

Since 1990: at least 20 000 persons leave the continent every year (ECA)

Over half of African students remain in the industrialised countries where they studied

100 000 non-African expatriates cost African countries 4 billion dollars a year
There is a real brain drain from Africa

Countries where African students go to study

Higher education students from Sub-Saharan Africa are the most mobile on the planet: 1 out of 16 (i.e. 5.6%) leaves Africa to study abroad, according to the 2006 edition of the UNESCO World Data on Education.

In 2004, 193,900 students were enrolled in higher education, of whom 16,000 were studying science and technology:

- 97,687 in Europe
- 37,325 in the United States and Canada
- 7,575 in Asia
- 4,689 in Arab States
- 40,946 in Africa
HR needed to meet the MDG challenge in Africa, given that one engineer or technician is need for every million dollars invested.

Example of drinking water: doubling the number of people with access to drinking water by 2015.
Can eco-innovation be an engine for growth for 2iE?
Applications to study at 2iE in 2009-2010

• **On-campus courses**: 3,000 applicants of 37 different nationalities

• **Open and distance learning**: 1,500 applicants of 43 different nationalities

⇒ **Inter-university and international doctoral school**
Growth of 2iE

- **On-campus courses:** from 220 (in 2005) to 850 students (in 2009)
- **Open and distance learning:** from 0 (in 2005) to 400 students (in 2009)
- **From 4 million euros turnover in 2004 to 8 million euros in 2008**
  - Fully funded 30 million euro investment plan for 2008-2012
  - 2,500 students in 2012 from over 40 African countries and worldwide.