Research Responding to Local Needs in the Context of Global Challenges

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Amman

4th Arab-Euro Conference on Higher Education
AECHE4
Research for sustainable societies - the role of universities

University Mohammad V
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24-26 April 2017
Arab Region is in a mess:

- Science policy in the Arab Region is in a state of dementia, due to incompatibility, instability, and most importantly an absence of the political well to capitalize on R&D for development and self-reliance.
Research & Development (R&D) Responding to Local Needs: Priority of the region.

- Speaking about research responding to local needs, with global context, the Arab Summit in Kuwait 2009, proclaimed an important resolution that priority of R&D in the Arab region is the triangle of energy, water, food security nexus.
R&D responding to the nexus:

Water sustains life, the environment and development. Human rights to water, as water is becoming a commodity, threatens the poor. Global water crisis in term of quantity and quality is a man-made disaster linked to environmental imbalance and degradation of the life-support ecosystem. It is a crisis of water management, fragmented institutions, inadequate policies and legal systems, lack of political will, and a widening gap between science and policy at the national, regional and global levels. Already one third of the world population is living in water-scarce areas. Climate change will accelerate the figure to one-half. 12% of the world’s population uses 85% of its fresh water. And water supply resources are being stretched to their limits. By 2050 an additional three billion people will be born mostly in countries already suffering from water shortage.
What to do:

✓ Invest in quality higher education (HE).
✓ Invest in scientific research.
✓ HE should be flexible to react quickly to demands, and create new demands.
✓ To graduate vehicles of development: entrepreneurs.
✓ HE should deliver quality and relevance.
✓ HE builds brain-intensive knowledge capital and stimulate growth.
autonomy & independence of academic, administrative & finance

admission policy based on merits

tuition based on student cost and scholarship based on merits

quality of teaching – learning. Faculty, students procurement on merits.

quality & relevance of research

transfer of knowledge and technology thru incubation to business parks & startup companies

the right equation of forward-looking university.
Mighty minds
Number of universities * in Shanghai ranking top 100, 2014-15

- United States: 1.6
- Britain: 1.3
- Switzerland: 6.2
- Netherlands: 2.4
- Australia: 1.7
- Canada: 1.1
- France: 0.6
- Germany: 0.5
- Sweden: 3.1
- Japan: 0.2

Source: The Economist March 28th, 2015, World Bank

*More than two
Nobel Prizes in Science & Medicine

European and U.S. shares accommodating emerging regions
Global Competitiveness index 2016-2017 ranking of countries of the world

Switzerland: 5.81
Singapore: 5.72
USA: 5.7
Netherlands: 5.57
Germany: 5.57
Sweden: 5.53
UK: 5.49
Finland: 5.44
Canada: 5.27
UAE: 5.26
Qatar: 5.23
Malaysia: 5.16
Saudi Arabia: 4.84
Kuwait: 4.53
Bahrain: 4.47
Turkey: 4.39
Jordan: 4.29
Oman: 4.28
Morocco: 4.2
Iran: 4.12
Algeria: 3.98
Tunisia: 3.92
Lebanon: 3.84
Egypt: 3.67
Pakistan: 3.54

Source: www3.weforum.org
Expenditure Indicators
The United States remains the world’s largest R&D investor spending in 2014. This is a globally competitive level of research intensity equal to 2.8% of U.S. GDP.

Total investment in R&D (as a percentage of GDP) stay relatively steady throughout the world in 2014

<table>
<thead>
<tr>
<th>Region</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMERICAS</td>
<td>2.5%</td>
<td>2.4%</td>
<td>2.5%</td>
</tr>
<tr>
<td>ASIA</td>
<td>1.8%</td>
<td>1.9%</td>
<td>1.9%</td>
</tr>
<tr>
<td>EUROPE</td>
<td>1.9%</td>
<td>1.9%</td>
<td>1.8%</td>
</tr>
<tr>
<td>REST OF WORLD</td>
<td>0.9%</td>
<td>0.9%</td>
<td>0.9%</td>
</tr>
</tbody>
</table>
Investment in Science
Who funds what in R&D

**Arab Region**
- Govt. sector: 70%
- Universities: 27%
- Private sector: 3%

**OECD**
- Private sector: 70%
- Universities: 17%
- Govt. sector: 10%
- Non-profit sector: 3%
Percentage of global research and development spending in 2016, by industry

- Computing & Electronics: 24.0%
- Healthcare: 21.1%
- Auto: 15.4%
- Software & Internet: 12.9%
- Industrials: 10.8%
- Chemicals & Energy: 5.5%
- Aerospace & Defense: 3.2%
- Telecom: 1.6%
- Other: 1.5%

Source: www.statista.com
Expenditures for R&D in selected countries & in Arab world (as a percentage of GDP) 2015

- Israel: 4.21
- Japan: 3.47
- Finland: 3.31
- Germany: 2.85
- USA: 2.81
- Australia: 2.25
- France: 2.23
- China: 2.01
- Singapore: 2.01
- UK: 1.63
- Malaysia: 1.13
- Turkey: 0.94
- India: 0.82
- Pakistan: 0.29

- Morocco: 0.73
- Tunisia: 0.68
- Egypt: 0.68
- United Arab Emirates: 0.49
- Jordan: 0.43
- Kuwait: 0.3
- Saudi Arabia: 0.07
- Iraq: 0.03

Source: data.OECD.org
Research Indicators
Research Indicator: Selected Countries & in the Arab World

Researchers (FTE’S) per million people, 2015

- Finland: 7,482
- Iceland: 7,012
- Israel: 6,602
- Singapore: 6,438
- Japan: 5,158
- Australia: 4,280
- Germany: 4,139
- United Kingdom: 4,024
- US: 3,979
- France: 3,918
- Malaysia: 1,643
- China: 1,020
- Turkey: 987
- South Africa: 364
- India: 160
- Pakistan: 149

Tunisia: 1,837
Morocco: 864
Egypt: 524
Iraq: 426
Kuwait: 132

Source: UNESCO Institute for Statistics
Scientific Publications Indicators
Number of Scientific & Technical Journal articles in selected countries in comparison with the Arab World

Source: National Science Foundation, Science and Engineering Indicators
Indexed Publications Intensity in the Middle East, 1996-2015

Source: Scimago Journal & Country Ranking (SJR)
Citations Per Research Paper, Published by Middle Eastern Countries, 1996-2015

Source: Scimago Journal & Country Ranking (SJR)
**H-Index for Middle East 1996-2015**

(Hirsch- Impact)

Source: Scimago Journal & Country Ranking (SJR)
TECHNOLOGY INDICATORS
Researcher-Ranked Global R&D Leaders by Technology Area

United Kingdom

- #2 Healthcare & Life Science
- #5 Military Aerospace
- #5 Composite / Nano / Advanced Materials
- #5 Environ. & Sustainability
- #5 Instruments & Electronics

United States

- #1 Agriculture & Food Prod.
- #1 Commercial Aerospace & Non-Automotive Transport
- #1 Military Aerospace
- #1 Composite / Nano / Advanced Materials
- #1 Healthcare & Life Science
- #1 Information & Communications
- #1 Instruments & Electronics
- #2 Energy Technology
- #2 Environment & Sustainability
- #3 Motor Vehicles

Germany

- #1 Motor Vehicles
- #1 Energy Generation & Efficiency
- #1 Environ. & Sustainability
- #2 Composite / Nano / Advanced Materials
- #3 Commercial Aerospace & Non-Automotive Transport
- #3 Healthcare & Life Science
- #3 Instruments & Electronics
- #4 Information & Communications

Japan

- #2 Motor Vehicles
- #2 Information & Communications
- #3 Instruments & Electronics
- #4 Healthcare & Life Science
- #5 Energy Technology
- #5 Commercial Aerospace & Non-Automotive Transport

China

- #2 Agriculture & Food Prod.
- #3 Military Aerospace
- #3 Energy Technology
- #3 Information & Communications
- #4 Commercial Aerospace & Non-Automotive Transport
- #5 Motor Vehicles
- #5 Composite / Nano / Advanced Materials
- #5 Instruments & Electronics
- #5 Healthcare & Life Science

Source: Battelle, R&D Magazine
High-technology exports in the Arab World and in Selected Countries

Source: United Nations, Comtrade database
PATENT INDICATORS
## Patent Applications filed in selected countries 2014

<table>
<thead>
<tr>
<th>Resident</th>
<th>Non-Resident</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>China</strong></td>
<td><strong>United States</strong></td>
</tr>
<tr>
<td><strong>285,096</strong></td>
<td><strong>127,042</strong></td>
</tr>
<tr>
<td><strong>265,959</strong></td>
<td><strong>25,683</strong></td>
</tr>
<tr>
<td><strong>164,073</strong></td>
<td><strong>17,811</strong></td>
</tr>
<tr>
<td><strong>48,154</strong></td>
<td><strong>14,500</strong></td>
</tr>
<tr>
<td><strong>24,072</strong></td>
<td><strong>12,040</strong></td>
</tr>
<tr>
<td><strong>15,196</strong></td>
<td><strong>7,321</strong></td>
</tr>
<tr>
<td><strong>14,500</strong></td>
<td><strong>7,844</strong></td>
</tr>
<tr>
<td><strong>12,040</strong></td>
<td><strong>7,216</strong></td>
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<tr>
<td><strong>4,659</strong></td>
<td><strong>6,924</strong></td>
</tr>
<tr>
<td><strong>4,198</strong></td>
<td><strong>2,033</strong></td>
</tr>
<tr>
<td><strong>1,988</strong></td>
<td><strong>9,009</strong></td>
</tr>
<tr>
<td><strong>1,303</strong></td>
<td><strong>United Kingdom</strong></td>
</tr>
<tr>
<td><strong>1,246</strong></td>
<td><strong>Indonesia</strong></td>
</tr>
<tr>
<td><strong>1,006</strong></td>
<td><strong>Thailand</strong></td>
</tr>
<tr>
<td><strong>702</strong></td>
<td><strong>France</strong></td>
</tr>
</tbody>
</table>

Source: World Intellectual Property Organization (WIPO)
Patent Applications filed in the Arab World 2014

**Non-Residents**

- UAE: 1,447
- Egypt: 1,384
- Morocco: 742
- Qatar: 477
- Tunisia: 400
- Jordan: 339
- Bahrain: 199
- Saudi Arabia: 135
- Kuwait: 111

**Residents**

- Egypt: 752
- Saudi Arabia: 652
- Morocco: 355
- Tunisia: 142
- Jordan: 40
- UAE: 24
- Bahrain: 6
- Qatar: 5
- Kuwait: 4

Source: World Intellectual Property Organization (WIPO)
Resident patent applications per 100 billion USD GDP for the top 10 origins

my motto:

ICID
Initiate, Create
Innovate, Disseminate

Thank you For Listening