

*Strategic Science and Technology fields
in IDB member countries*

Background document

Islamic Development Bank

Quick Win Project

*"Achieving Science and Technology
Academic Excellence for Development"*

February 2008

I- Preamble:

The main objective of this background paper is to identify, for each of the three IDB regions, Science and technology fields that are strategic for its development and for which S&T projects may be conducted in the frame work of the IDB Quick Win Project “*Achieving Science and Technology Academic Excellence for Development*”.

For the identification of strategic S&T fields, it is a quite common approach to do so by going through a process of general reflections that ends by expressions of hopes and wills, but with little concern to the existing potentials to conduct the concretisation of the expressed wills.

If such an approach is good for long term projects, for which one can afford building from scratch, and to some extent to medium term ones, it is inadequate for short term projects.

In this background paper and in order to be coherent with the logic of a short term project, the identification of strategic S&T fields will be made upon an analysis of objective facts, with the objective of identifying S&T fields that are both of common (regional) interest within each region and for which there exist already a good scientific potential.

This analysis relays on the study “*Status of Scientific Research in OIC Member States*”^[1] performed by the COMSTECH^[2] in 2005. One of the highlights of this study is the establishment of the list of the top ten S&T fields of interest within each country of the OIC region.

The analysis of these data, where some 103 S&T fields do appear, allows identification of S&T fields of regional interest in each of the three IDB regions, as well as providing a clear picture on the existing potentials within each region. The main results of this analysis are given in the next section (tables 2, 3 and 4), and the complete results are given in tables 7, 8 and 9 at the end of the document.

* [1] All IDB member countries are also OIC member countries.
www.comstech.org/htm/policy.htm

[2] OIC Standing Committee for Scientific and technological Cooperation

The result of this exercise will come out with identification of four (4) S&T fields for the Arab region, three (3) S&T fields for the Asian region and two (2) S&T fields for the African region.

Table 1: S&T fields of regional interest with present high scientific potential

S&T Fields	Arab region	Asian Region	African Region
Applied Mathematics & General Mathematics	X		
Chemical engineering & Energy and Fuels	X	X	
Materials science & Polymer Science	X	X	
Pharmacology and Pharmacy & Biochemistry and Molecular Biology	X	X	
Health			X
Agriculture			X

Rather curiously, the field of water resources, which is usually cited among the very strategic and highly critical for IDB member countries, doesn't find much interest within their scientific communities. The same thing may be said about the field of energy, which is of some interest, almost exclusively, only to the scientific communities of the Middle East countries.

An important output of the above identification process of S&T fields that are of regional interest is that almost all them do have strong linkages with the top ten nanotechnologies and biotechnologies that are potentially the most beneficial for the development of developing countries.

This conclusion indicates very clearly that IDB member countries are ready, from the scientific potentials point of view, to carry out S&T projects in these two new and world driving technologies.

Finally, eminent scientists within the Muslim countries need to be identified in order to monitor any S&T project to be conducted in the frame work of the IDB Quick Win Project "*Achieving Science and Technology Academic Excellence for Development*". For this, the COMSTECH ongoing study "*Leading Scientists and Engineers in OIC Member States*", whose results are expected to be make public in April 2008, will be of great help.

II- S&T fields of regional interest in the three IDB regions:

For a S&T field to be considered of regional interest, it has to be among the top ten fields in **at least half** (1/2) of the **first two third** (2/3) S&T producers of the region. This corresponds, for the African region (22 countries) to at least 7 countries among the first 15 ones and, for both the Asian and African regions (17 countries each) to at least 5 countries among the first 11 ones.

This “restriction” is motivated by the fact that one also needs to look for fields where potential cooperation within the region might be developed.

Also, each of the 103 S&T fields that appear in the above mentioned COMSTECH study will be assigned a “synthetic score” in order to quantify its importance within the region. The calculation mode of these “synthetic scores” is devised with regard to two targets^{*[3]}:

- reduce the domination of the large S&T producers, and, more importantly,
- put medium S&T producers in a position to play significant roles in this rather large regional exercise.

II-1: The Arab Region:

For the Arab region, the following four (4) fields of regional interest with present high scientific potential have been selected:

- chemical engineering and the very related field of energy and fuels
- applied mathematics and the very related field of general mathematics
- materials science and the very related field of polymer science
- pharmacology & pharmacy and the very related field of biochemistry & molecular biology

These four fields, although they are given in decreasing order, are of almost equal importance in the Arab countries, and their added synthetic scores represent about 37% of the total scores of all the top ten fields in the Arab countries (see Table 2 below).

* [3] See the technical notes on the calculation of synthetic scores.

The first two (2) S&T producers among Arab countries are concerned by the four fields and five (5) other Arab countries are concerned by three of the four fields. In total, sixteen (16) of the 22 Arab countries are concerned by at least one of these fields.

**Table 2: S&T fields of regional interest with present high scientific potential
(Arab region)**

Number of published article in (2005)	Egypt	Saudi Arabia	Lebanon	Tunisia	Morocco	Jordan	Algeria	Kuwait	Oman	UAE	Syria	Sudan	Qatar	Bahrain	Iraq	Libya	Palestine	Yemen	Mauritania	Comoros	Djibouti	Somalia	Synthetic score
In each cell, the number between brackets indicates the rank of the field among the top ten fields of the country.	3 459	1 751	1 563	1 437	1 176	959	862	668	334	265	224	147	138	129	100	81	63	54	21	6	4	3	
Engineering, Chemical Energy & Fuels	(10)	(7)				(1)	(4)	(2)	(2)	(4)			(3)	(1)	(8)	(2)							15 711
						(8)		(9)	(4)	(3)			(2)	(4)	(1)	(1)		(9)					7 928
																							23 639
Mathematics, Applied	(1)	(2)		(5)	(4)		(9)	(7)	(3)										(6)				17 634
Mathematics				(4)	(3)														(2)				5 809
																							23 443
Materials Science, Multidisciplinary	(3)	(8)		(1)	(5)		(1)						(10)	(5)				(8)					15 764
Polymer Science	(4)																	(2)					4 778
																							20 542
Pharmacology & Pharmacy	(5)	(3)			(9)	(6)		(4)		(6)						(9)		(4)					12 428
Biochemistry & Molecular Biology			(4)	(6)				(5)		(1)													7 842
																							20 270
																							238 130
																							Total over all top ten fields

The complete results for the Arab region are given in Table 7 at the end of the document.

II-2: The Asian Region:

For the Asian region, there are three (3) S&T fields of regional interest with present high scientific potential:

- pharmacology & pharmacy and the very related field of biochemistry & molecular biology
- materials science and the very related field of polymer science
- chemical engineering and the very related field of energy and fuels

The last two fields are of almost equal importance and are almost half important than the first one. Their added synthetic scores represent about

26% of the total scores of all the top ten fields in the countries of the Asian region (see Table 3 below).

The first three (3) S&T producers among Asian countries are concerned by all of these three fields and fifteen (15) of the 17 Asian countries are concerned by at least one of these fields.

**Table 3: S&T fields of regional interest with present high scientific potential
(Asian region)**

Number of published article in (2005)	Turkey	Iran	Malaysia	Pakistan	Indonesia	Bangladesh	Uzbekistan	Azerbaijan	Kazakhstan	Albania	Brunei	Tajikistan	Kyrgyzstan	Afghanistan	Turkmenist	Surinam	Maldives	Synthetic score
In each cell, the number between brackets indicates the rank of the field among the top ten fields of the country.																		
Pharmacology & Pharmacy	(8)	(5)	(8)	(6)	(5)	(7)										(1)		14 361
Biochemistry & Molecular Biology	(4)		(7)	(4)	(8)	(6)							(10)				(3)	15 706
																		30 067
Materials Science, Multidisciplinary	(5)		(4)			(10)	(10)	(1)	(9)	(6)		(6)						14 146
Polymer Science		(9)						(10)	(8)			(4)						2 572
																		16 718
Engineering, Chemical	(6)	(6)	(3)					(6)										14 628
Energy & Fuels								(8)			(6)							823
																		15 451
	Total over all top ten fields																	238 065

The complete results for the Asian region are given in Table 8 at the end of the document.

II-3: The African Region:

For the African region, there are only two (2) S&T fields of regional interest with present high scientific potential, namely, medical sciences and agricultural sciences.

For African countries, Health constitutes by far the highest preoccupation for them. The very much related fields of tropical medicine, infectious diseases, immunology, parasitology and virology are of central interest to almost all countries in Africa. The added scores of these fields represent about 35% of the total scores of all the top ten fields in the African countries (see Table 4 below).

Five (5) African countries are concerned by all of these five fields, four (4) other countries are concerned by four of the five fields and all the seventeen (17) African countries are concerned by at least one of these fields.

Agriculture is the second field of crucial importance to African countries. The added synthetic scores of fields like plant sciences, agronomy and agriculture represent about 15% of the total scores of all the top ten fields.

**Table 4: S&T fields of regional interest with present high scientific potential
(African region)**

Number of published article in (2005)	1 097	354	341	252	164	145	133	104	92	87	84	69	68	46	23	23	7	Synthetic score
	Nigeria	Cameroon	Uganda	Senegal	Benin	Cote d'Ivoire	Burkina Faso	Guinea	Mali	Gambia	Gabon	Niger	Mozambique	Togo	Chad	Guinea Bissau	Sierra Leone	
In each cell, the number between brackets indicates the rank of the field among the top ten fields of the country.																		
Tropical Medicine	(6)	(2)	(4)	(2)	(4)		(2)	(2)	(2)	(4)	(3)	(1)	(2)	(6)		(5)	(2)	13 611
Infectious Diseases		(4)	(1)	(3)		(2)	(3)	(2)	(6)	(2)	(1)		(3)		(8)	(1)	(3)	11 089
Immunology		(5)	(3)	(4)			(5)	(6)		(1)	(2)		(10)			(2)	(8)	7 271
Parasitology		(7)	(8)	(5)			(3)		(8)	(8)	(6)						(4)	4 393
Virology		(8)	(6)	(6)				(5)		(9)	(5)					(4)		3 966
																		40 330
Plant Sciences	(3)	(3)	(9)		(2)		(7)	(4)	(4)			(4)	(8)	(2)				8 963
Agronomy	(7)		(10)		(5)	(2)	(8)		(3)			(3)		(5)			(10)	5 573
Agriculture, Multidisciplinary	(8)				(9)	(2)						(4)					(4)	3 101
																		17 637
	Total over all top ten fields																	114 489

The complete results for the African region are given in Table 9 at the end of the document.

III- S&T perspectives for IDB member countries:

III-1: Nanotechnology and biotechnology perspectives:

With regard to the S&T fields identified in the previous section, it comes out that IDB member countries possess solid grounds, from the scientific potentials point of view, for implementation of the new and presently world driving technologies that are nanotechnologies and biotechnologies.

This statement appears very clearly through the bellow diagram (Fig. 1), where are shown the linkages between the S&T fields of Health, Agriculture, Pharmacology, Materials and Mathematics and, on one hand, the top ten applications of nanotechnologies that are the “most likely to benefit developing countries in the areas of water, agriculture, nutrition, health, energy, and environment”^{”*[4]} and, on a second hand, the top ten biotechnologies that “can help improve health in developing countries”, and this with regard to the criteria of “**impact, burden, appropriateness, feasibility, knowledge gap and indirect benefits**”^{”*[5]}.

The indicated linkages summarise the contents of the correlation tables 5 and 6 given bellow.

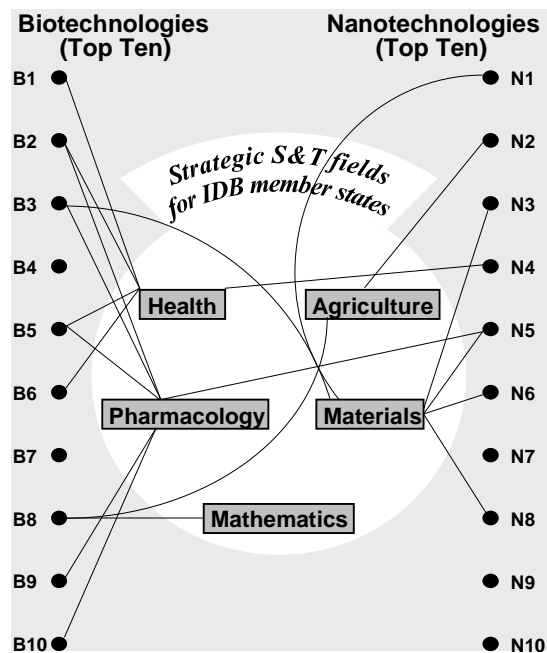


Fig. 1: Linkages between strategic S&T fields in the IDB regions and the top ten nanotechnologies and biotechnologies

* [4] These areas are the ones identified by the 2002 United Nations World Summit on sustainable development.

[5] **Impact:** How much difference will the technology make in improving the concerned areas in developing countries?

Burden: Will it address the most pressing needs?

Appropriateness: Will it be affordable, robust, and adjustable to settings in developing countries, and will it be socially, culturally, and politically acceptable?

Feasibility: Can it realistically be developed and deployed in a time frame of ten years?

Knowledge gap: Does the technology advance quality of life by creating new knowledge?

Indirect benefits: Does it address other issues such as capacity building and income generation that have indirect, positive effects on developing countries

Both of these top ten nanotechnologies and biotechnologies were identified through surveys^{*[6, 7]} conducted, for nanotechnology, among a panel of 63 experts, 38 of them being from developing countries, and for biotechnology, among a panel of 28 experts, who are at the forefront of their fields, about half of them work in developing countries.

III-2: Mathematics' perspectives:

With regard to synthetic scores and as it is shown in tables 1 and 7, applied mathematics:

- ranks first (1st) among the S&T field in the Arab region, and
- is among the top ten S&T fields in seven (7) of the first nine (9) S&T producers.

It is universally admitted that mathematics in general, and applied mathematics in particular, play important roles in almost every discipline, not only as a “back office” tool, but as a major tool, for example, whenever modelling, resolution of equations and calculation of approximate solutions are concerned.

As shown in Fig 1 above, there is a link between mathematics and the 8th of the top ten biotechnologies for improving health in developing countries.

Because of the big economic potential associated with their development, two (2) other fields of mathematics, where both general and applied mathematics are concerned, deserve to focus on and to be encouraged. These are:

- (1) financial mathematics for stock exchange markets activities, and
- (2) cryptography for all what concerns securing of data exchanges, authentication protocols, and financial operations (e-money).

* [6] Nanotechnology and the developing world. (PLoS Medicine, vol. 2(4), April 2005)
www.utoronto.ca/jcb/home/documents/PLoS_nanotech.pdf

[7] Top ten biotechnologies for improving health in developing countries (Nature genetics, vol. 32, October 2002)
www.nature.com/ng/journal/v32/n2/pdf/ng1002-229.pdf

Table 5: Correlations between the top ten applications of nanotechnologies and the Strategic S&T fields in the IDB regions.

Ranking (Score)*	Applications of Nanotechnology	Examples [♯]	Concerned IDB regions and strategic S&T fields
1 (766)	Energy storage, production, and conversion	<ul style="list-style-type: none"> Novel hydrogen storage systems based on carbon nanotubes and other lightweight nanomaterials Photovoltaic cells and organic light-emitting devices based on quantum dots Carbon nanotubes in composite film coatings for solar cells Nanocatalysts for hydrogen generation Hybrid protein-polymer biomimetic membranes 	Arab Asia (Materials Science)
2 (706)	Agricultural productivity enhancement	<ul style="list-style-type: none"> Nanoporous zeolites for slow-release and efficient dosage of water and fertilizers for plants, and of nutrients and drugs for livestock Nanocapsules for herbicide delivery Nanosensors for soil quality and for plant health monitoring Nanomagnets for removal of soil contaminants 	Africa (Agriculture)
3 (682)	Water treatment and remediation	<ul style="list-style-type: none"> Nanomembranes for water purification, desalination, and detoxification Nanosensors for the detection of contaminants and pathogens Nanoporous zeolites, nanoporous polymers, and attapulgite clays for water purification Magnetic nanoparticles for water treatment and remediation TiO₂ nanoparticles for the catalytic degradation of water pollutants 	Arab Asia (Materials Science)
4 (606)	Disease diagnosis and screening	<ul style="list-style-type: none"> Nanoliter systems (Lab-on-a-chip) Nanosensor arrays based on carbon nanotubes Quantum dots for disease diagnosis Magnetic nanoparticles as nanosensors Antibody-dendrimer conjugates for diagnosis of HIV-1 and cancer Nanowire and nanobelt nanosensors for disease diagnosis Nanoparticles as medical image enhancers 	Africa (Health)
5 (558)	Drug delivery systems	<ul style="list-style-type: none"> Nanocapsules, liposomes, dendrimers, buckyballs, nanobiomagnets, and attapulgite clays for slow and sustained drug release systems 	Arab Asia (Pharmacology, Materials Science)
6 (472)	Food processing and storage	<ul style="list-style-type: none"> Nanocomposites for plastic film coatings used in food packaging Antimicrobial nanoemulsions for applications in decontamination of food equipment, packaging, or food Nanotechnology-based antigen detecting biosensors for identification of pathogen contamination 	Arab Asia (Materials Science)
7 (410)	Air pollution and remediation	<ul style="list-style-type: none"> TiO₂ nanoparticle-based photocatalytic degradation of air pollutants in self-cleaning systems Nanocatalysts for more efficient, cheaper, and better-controlled catalytic converters Nanosensors for detection of toxic materials and leaks Gas separation nanodevices 	
8 (366)	Construction	<ul style="list-style-type: none"> Nanomolecular structures to make asphalt and concrete more robust to water seepage Heat-resistant nanomaterials to block ultraviolet and infrared radiation Nanomaterials for cheaper and durable housing, surfaces, coatings, glues, concrete, and heat and light exclusion Self-cleaning surfaces (e.g., windows, mirrors, toilets) with bioactive coatings 	Arab Asia (Materials Science)
9 (321)	Health monitoring	<ul style="list-style-type: none"> Nanotubes and nanoparticles for glucose, CO₂, and cholesterol sensors and for in-situ monitoring of homeostasis 	
10 (258)	Vector and pest detection and control	<ul style="list-style-type: none"> Nanosensors for pest detection Nanoparticles for new pesticides, insecticides, and insect repellents 	

* The maximum total score an application could receive was 819.

[♯] The examples are as listed in the above mentioned study “Nanotechnology and the developing world”. Are indicated in **bold character** the examples with potential link to the strategic S&T field in the IDB member countries.

Table 6: Correlations between the top ten biotechnologies and the Strategic S&T fields in the IDB regions.

Ranking (Score)	Applications of Nanotechnology	Concerned IDB regions and strategic S&T fields
1 (288)	Modified molecular technologies for affordable, simple diagnosis of infectious diseases	Africa (Health)
2 (262)	Recombinant technologies to develop vaccines against infectious diseases	Africa (Health) Arab, Asia (Pharmacology)
3 (245)	Technologies for more efficient drug and vaccine delivery systems	Arab, Asia (Pharmacology, Materials Science)
4 (193)	Technologies for environmental improvement (sanitation, clean water, bioremediation)	
5 (180)	Sequencing pathogen genomes to understand their biology and to identify new antimicrobials	Africa (Health) Arab, Asia (Pharmacology)
6 (171)	Female-controlled protection against sexually transmitted diseases, both with and without contraceptive effect	Africa (Health)
7 (168)	Bioinformatics to identify drug targets and to examine pathogen–host interactions	Arab, Asia (Mathematics)
8 (159)	Genetically modified crops with increased nutrients to counter specific deficiencies	Africa (Agriculture)
9 (155)	Recombinant technology to make therapeutic products (for example, insulin, interferons) more affordable	Arab, Asia (Pharmacology)
10 (129)	Combinatorial chemistry for drug discovery	Arab, Asia (Pharmacology)

Technical Notes on the calculation of synthetic scores

The synthetic scores indicated in tables 2, 3, 4, 7, 8 and 9 are calculated by adding over the countries the products of the followings:

- a “**field rank score**”^[8, 9] that is equal to
 - 100 for the 1st ranked field,
 - 90 for the 2nd ranked and
 - 10 for the last (10th) ranked field within each country;
- a “**country weight**” equal to the square root ($\sqrt{\quad}$) of the number of articles it published in the year 2005, this last data being taken from the study “*Science and Technology in the OIC Member*”^[10] realised by the SESRTCIC^[11] in 2007.

This choice for the country weight is motivated by the fact that the numbers of published S&T articles in the year 2005 by the different IDB member states, form a broad spectrum, ranging from one (1) publication (Maldives) to 17 717 publications (Turkey). Taking the square root reduces the wideness of the above mentioned spectrum from 17 717 to only 133.

The major consequence of this “rescaling” is that medium S&T producers become in a position to play significant roles in this rather large regional exercise. Another consequence, but less important, is that small S&T producers are much less overflowed by the big S&T producers.

* [8] It would have been much more accurate to take for the “field rank score” a quantity proportional to the share (%) of the S&T output (published articles) of the field within the S&T output of all of the top ten fields. But it wasn’t possible to get these data.

[9] For some countries, the sum of the synthetic scores of their top ten fields exceeds the “theoretical” synthetic score of the country because some of the top ten fields are equally ranked.

[10] www.sesrtcic.org/files/science/scienceAndTechnologyInOICMemberCountries.pdf

[11] Statistical, Economic and Social Research and Training Center for Islamic Countries.

Table 7: Top ten S&T Fields in the Arab Region countries / decreasing order of importance

Number of published article in (2005)		3 459	1 751	1 563	1 437	1 176	959	862	668	334	265	224	147	138	129	100	81	63	54	21	6	4	3	Synthetic score	
In each cell, the number between brackets indicates the rank of the field among the top ten fields of the country.		Egypt	Saudi Arabia	Lebanon	Tunisia	Morocco	Jordan	Algeria	Kuwait	Oman	UAE	Syria	Sudan	Qatar	Bahrain	Iraq	Libya	Palestine	Yemen	Mauritania	Comoros	Djibouti	Somalia		
Med	Medicine, General & Internal		(1)	(7)		(2)		(1)		(7)		(3)	(1)	(2)	(2)	(3)		(1)				(5)	(5)	17 470	
Med	Surgery		(4)	(3)						(6)				(6)	(9)										7 820
Med	Dentistry, Oral Surgery & Medicine		(5)			(6)		(3)																	6 127
Med	Oncology			(1)																					3 953
Med	Hematology			(2)																					3 558
Med	Tropical Medicine									(7)		(1)						(6)	(3)	(1)	(2)	(2)			3 258
Med	Clinical Neurology			(5)						(8)															2 920
Med	Public, Environmental & Occupational Health			(10)								(2)						(7)		(3)	(2)	(2)	(1)		2 744
Med	Immunology			(6)								(7)										(5)			2 581
Med	Cardiac & Cardiovascular Systems			(7)										(9)									(5)		1 920
Med	Medicine, General & Internal Pediatrics									(1)															1 828
Med	Psychiatry			(9)																					791
Med	Parasitology											(9)								(5)	(4)				689
Med	Physiology										(8)														488
Med	Infectious Diseases																				(4)	(5)	(5)		395
Med	Nutrition & Dietetics											(8)													364
Med	Anesthesiology																					(1)	(5)		304
Med	Ophthalmology																				(4)				172
Med	Dermatology																				(9)				49
																							57 431		
Phar	Pharmacology & Pharmacy	(5)	(3)			(9)	(6)	(4)		(6)							(9)		(4)						12 428
																							12 428		
Eng	Engineering, Chemical	(10)	(7)			(1)	(4)	(2)	(2)	(4)			(3)	(1)	(8)	(2)									15 711
Eng	Energy & Fuels					(8)	(7)	(9)	(4)	(3)			(2)	(4)	(1)	(1)		(9)							7 928
Eng	Engineering, Electrical & Electronic					(5)	(7)	(5)						(7)	(3)	(9)	(10)								5 798
Eng	Nuclear Science & Technology											(3)					(5)								1 738
Eng	Engineering, Petroleum												(4)				(4)								1 453
Eng	Food Science & Technology								(8)			(5)													1 276
Eng	Engineering, Environmental																	(8)							238
																							34 142		
Chem	Chemistry, Physical	(6)	(9)	(2)	(1)		(3)				(9)		(4)		(9)										14 289
Chem	Chemistry, Multidisciplinary	(2)					(8)							(8)	(6)			(4)	(5)						8 023
Chem	Chemistry, Analytical		(6)									(4)					(6)	(10)							3 669
Chem	Chemistry, Inorganic & Nuclear	(7)										(7)					(8)	(6)							3 618
Chem	Chemistry, Organic				(10)													(8)							581
Chem	Chemistry, Medicinal																	(6)							368
Chem	Chemistry, Applied											(10)									(9)				170
																							30 718		

Phys	Physics, Condensed Matter	(8)		(3)	(6)	(2)														9 154
Phys	Physics, Multidisciplinary	(9)			(2)	(6)								(2)						6 445
Phys	Mechanics		(10)			(3)								(3)						3 696
Phys	Physics, Applied					(5)								(10)						1 875
Phys	Thermodynamics					(9)								(3)						1 419
Phys	Crystallography			(8)																1 137
Phys	Physics, Nuclear													(5)						600
																				24 326
Phys-M	Materials Science, Multidisciplinary	(3)	(8)	(1)	(5)	(1)							(10)	(5)				(8)		15 764
Phys-M	Polymer Science	(4)																(2)		4 778
																				20 542
Math	Mathematics, Applied	(1)	(2)		(5)	(4)		(9)	(7)	(3)								(6)		17 634
Math	Mathematics				(4)	(3)												(2)		5 809
																				23 443
Bio	Biochemistry & Molecular Biology			(4)	(6)			(5)	(1)											7 842
Bio	Cell Biology			(8)				(8)	(2)											3 427
Bio	Biotechnology & Applied Microbiology				(9)														(5)	758
Bio	Microbiology				(10)															499
Bio	Biology								(9)											326
Med	Genetics & Heredity								(9)											326
																				13 178
Agr	Plant Sciences				(8)				(2)	(6)								(3)		3 570
Agr	Agronomy								(1)									(10)		1 543
Agr	Horticulture								(5)											898
Agr	Agriculture, Multidisciplinary								(6)										(5)	852
Agr	Agriculture, Soil Science								(8)											449
Agr	Agriculture, Dairy & Animal Science													(7)						400
Vet	Veterinary Sciences									(4)								(1)		1 306
																				9 018
Nat	Environmental Sciences					(4)		(6)	(5)	(10)					(4)	(9)	(7)	(4)		5 644
Nat	Ecology																		(2)	221
Nat	Marine & Freshwater Biology																(7)			183
Nat	Oceanography																(7)			183
Nat	Biodiversity Conservation																	(4)		172
																				6 403
Div	Water Resources					(10)	(10)		(10)					(6)	(6)					1 804
Div	Geosciences, Multidisciplinary				(7)														(2)	1 522
Div	Information Science & Library Science														(1)					794
Div	Area Studies														(2)					715
Div	Computer Science, Interdisciplinary													(7)						454
Div	Interdisciplinary Applications													(7)						454
Div	Multidisciplinary Sciences						(10)												(5)	362
Div	Planning and Development																		(3)	138
Div	Social Sciences, Interdisciplinary																		(3)	138
Div	Geochemistry & Geosciences																	(5)		120
																				6 501

Table 8: Top ten S&T Fields in the Asian Region countries / decreasing order of importance

Number of published article in (2005)		17 717	5 578	1 806	1 264	703	649	397	281	261	73	41	37	25	21	6	5	1	Synthetic score
In each cell, the number between brackets indicates the rank of the field among the top ten fields of the country.		Turkey	Iran	Malaysia	Pakistan	Indonesia	Bangladesh	Uzbekistan	Azerbaijan	Kazakhstan	Albania	Brunei	Tajikistan	Kyrgyzstan	Afghanistan	Turkmenist	Surinam	Maldives	
Med	Surgery	(1)										(4)							13 759
Med	Pediatrics	(2)																	11 980
Med	Clinical Neurology	(3)																	10 649
Med	Psychology, Multidisciplinary		(3)																5 975
Med	Public, Environmental & Occupational Health				(10)	(3)	(1)				(10)				(4)			(3)	5 510
Med	Cardiac & Cardiovascular Systems	(9)									(6)			(8)					3 239
Med	Medicine, General & Internal				(8)						(3)				(1)				2 208
Med	Infectious Diseases						(5)								(6)				1 758
Med	Tropical Medicine					(6)									(3)				1 692
Med	Obstetrics & Gynecology	(10)																	1 331
Med	Nutrition & Dietetics					(6)													1 326
Med	Immunology						(9)												510
Med	Peripheral Vascular Disease										(6)								427
Med	Rheumatology														(2)				412
Med	Psychiatry													(7)					200
Med	Health Care Sciences & Services																(7)		90
Med	Health Policy & Services																(7)		90
																			61 156
Phar	Pharmacology & Pharmacy	(8)	(5)	(8)	(6)	(5)	(7)										(1)		14 361
																			14 361
Chem	Chemistry, Analytical		(4)													(8)			5 302
Chem	Chemistry, Multidisciplinary		(1)		(2)			(2)		(7)									13 108
Chem	Chemistry, Organic		(2)					(1)	(5)	(2)				(5)					11 474
Chem	Chemistry, Physical		(8)	(9)					(3)	(1)			(8)						6 230
Chem	Chemistry, Medicinal				(3)												(3)		3 023
Chem	Chemistry, Applied				(5)												(4)		2 290
Chem	Chemistry, Inorganic & Nuclear				(7)				(10)		(3)		(9)					(8)	2 247
																			43 674
Eng	Engineering, Chemical	(6)	(6)	(3)					(6)										14 628
Eng	Engineering, Electrical & Electronic		(10)	(2)								(7)							4 828
Eng	Food Science & Technology			(5)															2 550
Eng	Nuclear Science & Technology				(9)					(3)									2 004
Eng	Energy & Fuels								(8)		(6)								823
Eng	Engineering, Petroleum								(9)										335
																			25 168

Table 9: Top ten S&T Fields in the Africa Region Countries / decreasing order of importance

Number of published article in (2005)		1 097	354	341	252	164	145	133	104	92	87	84	69	68	46	23	23	7	Synthetic score
		Nigeria	Cameroon	Uganda	Senegal	Benin	Cote d'Ivoire	Burkina Faso	Guinea	Mali	Gambia	Gabon	Niger	Mozambique	Togo	Chad	Guinea Bissau	Sierra Leone	
Med	Public, Environmental & Occupational Health	(2)	(1)	(2)	(1)	(3)	(1)	(1)	(1)	(1)	(2)	(4)	(2)	(1)	(4)	(4)	(3)	(1)	17 986
Med	Tropical Medicine	(6)	(2)	(4)	(2)	(4)		(2)	(2)	(2)	(4)	(3)	(1)	(2)	(6)		(5)	(2)	13 611
Med	Infectious Diseases		(4)	(1)	(3)		(2)	(3)	(2)	(6)	(2)	(1)		(3)		(8)	(1)	(3)	11 090
Med	Immunology		(5)	(3)	(4)			(5)	(6)		(1)	(2)		(10)			(2)	(8)	7 271
Med	Parasitology		(7)	(8)	(5)			(3)		(8)	(8)	(6)						(4)	4 393
Med	Virology		(8)	(6)	(6)				(5)		(9)	(5)					(4)		3 966
Med	Medicine, General & Internal	(10)		(5)	(9)		(2)				(5)						(6)	(6)	3 773
Med	Pediatrics										(6)				(1)		(7)		1 337
Med	Pathology									(5)			(6)			(8)			1 135
Med	Obstetrics & Gynecology													(4)				(6)	710
Med	Urology & Nephrology								(6)										510
Med	Peripheral Vascular Disease													(6)					413
Med	Dermatology									(9)						(8)			336
Med	Health Policy & Services								(8)										306
Med	Tropical Health															(5)			288
Med	Medicine, Research & Experimental																(9)		96
Med	Ophthalmology													(10)					68
67 289																			
Phar	Pharmacology & Pharmacy	(4)	(6)							(7)		(10)			(6)				4 073
4 073																			
Agr	Plant Sciences	(3)	(3)	(9)		(2)		(7)	(4)	(4)			(4)	(8)	(2)				8 963
Agr	Agronomy	(7)		(10)		(5)	(2)	(8)		(3)			(3)		(5)			(10)	5 573
Agr	Agriculture, Multidisciplinary	(8)				(9)	(2)						(4)					(4)	3 101
Agr	Agriculture, Soil Science				(10)			(9)							(8)				593
Agr	Zoology											(6)							459
Vet	Veterinary Sciences				(8)			(6)			(7)			(8)		(1)	(8)		2 297
20 986																			
Nat	Environmental Sciences	(5)				(8)							(10)	(6)					2 867
Nat	Entomology					(1)		(10)		(9)					(3)				2 131
Nat	Ecology			(7)									(7)						1 071
Nat	Marine & Freshwater Biology													(4)					578
6 647																			

Eng	Food Science & Technology	(1)	(9)			(7)													4 201
Eng	Energy & Fuels						(2)												1 084
Eng	Metallurgy & Metallurgical Engineering						(2)												1 084
																			6 369
Bio	Microbiology					(7)								(9)				(9)	914
Bio	Biochemistry & Molecular Biology								(8)					(8)			(8)		785
Bio	Biotechnology & Applied Microbiology					(6)													641
Bio	Genetics & Heredity												(10)						93
																			2 433
Chem	Chemistry, Physical						(2)												1 084
Chem	Chemistry, Applied	(9)				(9)													919
Chem	Chemistry, Medicinal		(9)																376
																			2 379
Phys	Crystallography						(2)												1 084
																			1 084
Phys-M	Materials Science, Multidisciplinary						(2)												1 084
																			1 084
Div	Geosciences, Multidisciplinary									(8)				(9)			(1)		952
Div	Multidisciplinary Sciences																(3)		384
Div	Water Resources													(8)					249
Div	Paleontology																(6)		240
Div	Religion																(6)		240
Div	Language & Linguistics Theory																	(8)	80
																			2 145