

International data collection and uses of international data by UIS: Overview of data for East Africa

*SEMINAR – WORKSHOP ON SCIENCE, TECHNOLOGY AND INNOVATION INDICATORS
Mombasa, Kenya
30 March - 3 April 2009*

- The UNESCO Institute for Statistics (UIS)
- Survey of S&T statistics: 2004, 2006 and 2008
- Overview of S&T statistics for Africa
- The way forward



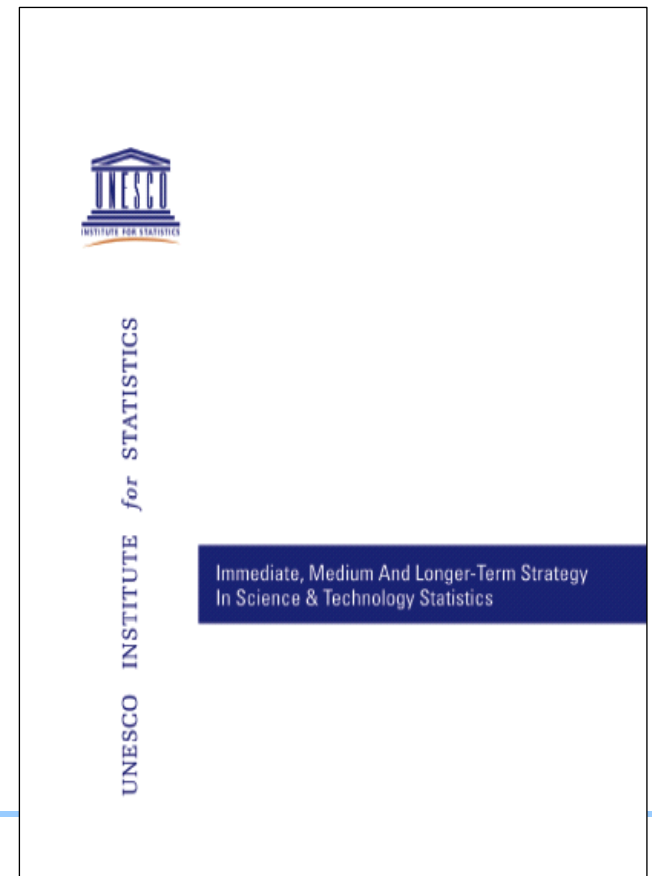
UIS is UN lead agency for S&T Statistics

Official S&T data source for:

- **UN Statistical Division:** UN Statistical Year Book
- **UNDP:** Human Development Report
- **World Bank:** World Development Indicators
- **UNESCO Reports:**
 - UNESCO Science Report
 - UNESCO World Report - Towards Knowledge Societies
 - International Report on S&T and Gender

UIS Strategy on S&T statistics

- *International Review of S&T Statistics and Indicators* jointly with UNESCO Science Policy Division, 2002-03, involving **all Member States** and numerous experts. Resulting priorities:
- Immediate term:
 - R&D personnel & expenditure
 - Human resources devoted to S&T
 - Science education & Higher education
 - International mobility
 - Gender
- Medium term: Innovation
- Longer term: Output & Impact





Lines of action

- S&T Survey operation and data guardianship
- Training in S&T statistics: Workshops & other training activities
- Standard setting and methodological developments
- Analysis & Publications
- Collaborations & Partnerships



S&T Survey operation and data guardianship

- **Global Survey on Statistics of Science & Technology:** Biennially – 3rd round has been launched in June 2008. Data will be published in May/June 2009.
- Global Database on S&T Statistics
- Data dissemination: on the UIS website and through contributions to other agencies.



Survey on Statistics of Science & Technology

- The 2004 and 2006 S&T statistics surveys have been completed.
- The latest resulting data were released on the UIS website in June 2008.
<http://stats.uis.unesco.org/unesco/tableviewer/document.aspx?FileId=76>
- The 2008 S&T statistics survey was launched in June 2008. Data will be published in May/June 2009.
- OECD and EUROSTAT provide data for their Member States. RICYT provides data for Latin America. UIS keeps direct contact with national S&T statisticians.

Global Survey on S&T Statistics

- The Questionnaire on Statistics of Science and Technology is sent to each country focal point, either the institution responsible for S&T policy or statistics (e.g. Ministry of Science and Technology, Ministry of Research and Higher Education, National S&T Council or similar organization) or the National Statistical Office.
- Each country has to provide one single questionnaire with data on all institutions carrying out R&D activities in all the sectors in the particular country.

Data collected:

- R&D personnel by **occupation & gender**
- R&D personnel by **sector of employment & occupation**
- R&D personnel by **sector of employment & gender**
- **Researchers** by **formal qualification & sector of employment**
- Researchers by **formal qualification & gender**
- Researchers by **fields of science & sector of employment**
- Researchers by **fields of science & gender**
- **Total expenditure in R&D by sector of performance**
- **Total expenditure in R&D by source of funds**



UIS/ST/2008

Montreal, June 2008

Country: _____

QUESTIONNAIRE ON STATISTICS OF SCIENCE AND TECHNOLOGY (S&T)

Data for the year 2007 and prior

This questionnaire is designed to collect the most recent statistics on science and technology (S&T), specifically resources devoted to research and experimental development (R&D), in order to update the UIS database on S&T indicators. This survey is carried out in cooperation with the UNESCO Division for Science Policy and Sustainable Development. The data can be accessed on the UIS website and will be published in reports prepared by UNESCO, other UN agencies, and public and private institutions or individuals worldwide.

Please return one completed questionnaire before 28 August 2008. The UNESCO Institute for Statistics (UIS) strongly encourages the use of the electronic form available at <http://www.uis.unesco.org>. The electronic form can be submitted directly to the UIS by clicking on the [Submit] button at the end of the questionnaire or emailed to st2008@uis.unesco.org. Questionnaires completed using the printed forms should be sent to:

UNESCO Institute for Statistics
Data Processing and Standards Unit
P.O. Box 6128, Succursale Centre-Ville
Montreal, Quebec H3C 3J7
Canada

For any queries, please contact the UIS by email: st2008@uis.unesco.org, fax: (1 514) 343-6740 or telephone: (1 514) 343-6880.

Please refer to the *Instruction Manual for Completing the Questionnaire on Statistics of Science and Technology and Data Entry Manual* before completing the questionnaire.

Only one questionnaire per country should be completed by the institution responsible for S&T policy or S&T statistics (e.g. Ministry of Science and Technology, Ministry of Research and Higher Education, National S&T Council or a similar organization) or by the National Statistical Office.

Data reported in this questionnaire should cover all institutions carrying out R&D activities in your country. If this is not the case, please provide a detailed explanation using a comment in the electronic form or footnote in the printed form. To enter comments in the electronic form, please press on the [Shift] key and the left mouse button simultaneously.

Please do not leave any cell blank. The following codes should be used wherever figures are not available:

- a = category not applicable
- m = data missing (or not available)
- n = quantity nil
- x = data included in another category (please specify where using a comment or footnote)

Estimated or provisional data should be marked with an asterisk (*).

The electronic form contains automatic error checks. A list of these checks is available in the *Data Entry Manual* for reference when using the printed forms. Kindly correct or explain failed checks using a comment or footnote.



Additional data to be collected in the future (consultation in Q2008)

- Researchers by age
- Researchers by: country of birth; citizenship/resident status
- Researchers by fields of science at 2 digit level
- R&D expenditure by field of science (at 1 digit level)
- R&D expenditure by type of expenditure (Current / Capital): Total; Current only
- R&D expenditure by type of R&D activity (Basic research; applied research; experimental development): Total; Only current costs
- R&D Expenditure by major socio-economic objective
- Government budget appropriations or outlays for R&D (GBAORD): Total; by major socio-economic objective
- Business enterprise researchers by industry / branch of economic activity (at 1 digit level of International Standard Industrial Classification, ISIC)
- Business enterprise R&D expenditure by industry / branch of economic activity (at 1 digit level of ISIC)

UIS 2006 and 2008 Surveys on R&D

Response rates & published data

Regions (Countries and Territories covered)	Responses Q 2006			Responses Q 2008			Published data			
Sub-Saharan Africa (46)	27	59%	61%	20	43%	43%	23	50%	52%	
Arab States-Africa (8)	6	75%		3	38%		5	63%		
Asia (31, excl. Arab States & OECD)	21	68%	65%	20	65%	60%	23	74%	60%	
Arab States - Asia (12)	7	58%		6	50%		3	25%		
Americas (19, excl. RICYT & OECD)	4	21%		4	21%		4	21%		
Europe (16, excl. OECD & Eurostat)	9	56%		11	69%		7	44%		
Oceania (17, excl. OECD)	0	0%		4	24%		2	12%		
Sub-total (149)	74	50%		68	46%		67	45%		
<i>Data from other sources:</i>										
OECD + Eurostat (43)	<i>Total coverage</i>			<i>Total coverage</i>			43	100%		
RICYT (23)							19	83%		
Total (215)	140	65%		134	62%		129	60%		

Respondents to the UIS S&T 2006 and 2008 questionnaires from SADC countries

Country	2006 S&T Survey	2008 S&T Survey
Angola	Data not provided	Data not provided
Botswana	<i>(Partial)</i> Data provided	Data not provided
D.R. of the Congo	<i>(Partial)</i> Data provided	Data not provided
Lesotho	<i>(Partial)</i> Data provided	Data not provided
Madagascar	<i>(Partial)</i> Data provided	Data provided
Malawi	Data not provided	Data not provided
Mauritius	<i>(Partial)</i> Data provided	Data not provided
Mozambique	Data not provided	Data provided
Namibia	Data not provided	Data not provided
South Africa	Data provided	Data provided
Tanzania	Data not provided	Data provided
Zambia	<i>(Partial)</i> Data provided	Data not provided
Zimbabwe	Data not provided	Data not provided

Other respondents to the UIS 2006 and 2008 questionnaires in Africa

Country	2006 S&T Survey	2008 S&T Survey
Burundi	Data provided	Data not provided
Egypt	Data not provided	Data provided
Eritrea	Data not provided	Data not provided
Ethiopia	Data provided	Data provided
Kenya	Data provided	Data not provided
Rwanda	Data not provided	Data not provided
Seychelles	Data not provided	Data not provided
Sudan	Data provided	Data not provided
U.R. Tanzania	Data not provided	Data not provided



<http://www.uis.unesco.org>

Data and Indicators published:

- **Number of Total R&D personnel (Headcount-HC and Full-time equivalent-FTE) by sex**
- **Total R&D personnel (FTE) by sector of employment**
- **Researchers (HC and FTE) by sex**
- **Researchers (FTE) by sector of employment**
- **Technicians and equivalent staff (HC and FTE) by sex**
- **Other supporting staff (HC and FTE) by sex**
- **Researchers per million inhabitants (HC and FTE)**
- **Technicians per million inhabitants (HC and FTE)**
- **Women as a percentage of R&D personnel (HC and FTE)**
- **Women as a percentage of Researchers (HC and FTE)**
- **Total Gross Domestic Expenditure on R&D (GERD) in local currency and international Purchasing Power Parity (PPP) dollars**
- **GERD by sector of performance (%)**
- **GERD by source of funds (%)**
- **GERD as a percentage of Gross Domestic Product (GDP)**
- **GERD per capita**

R&D Personnel, Africa, 2007 or last available year

Country	Year	Researchers (FTE)	Researchers per million inhabitants (FTE)
Algeria	2005*	5,593	170
Botswana	2005* (HC)	1,728	941
Burkina Faso	2007*	181	12
Cameroun	2005*	462	26
Cape-Verde	2002*	60	127
Congo	2000*	102	32
Côte d'Ivoire	2005*	1,269	68
D.R. of Congo	2005* (HC)	10,411	177
Ethiopia	2007*	1,615	19
Gabon	2006* (HC)	150	114
Gambia	2005*	46	28
Guinea	2000* (HC)	2,117	258
Lesotho	2004*	20	10

Source: UIS S&T Database, 2009.

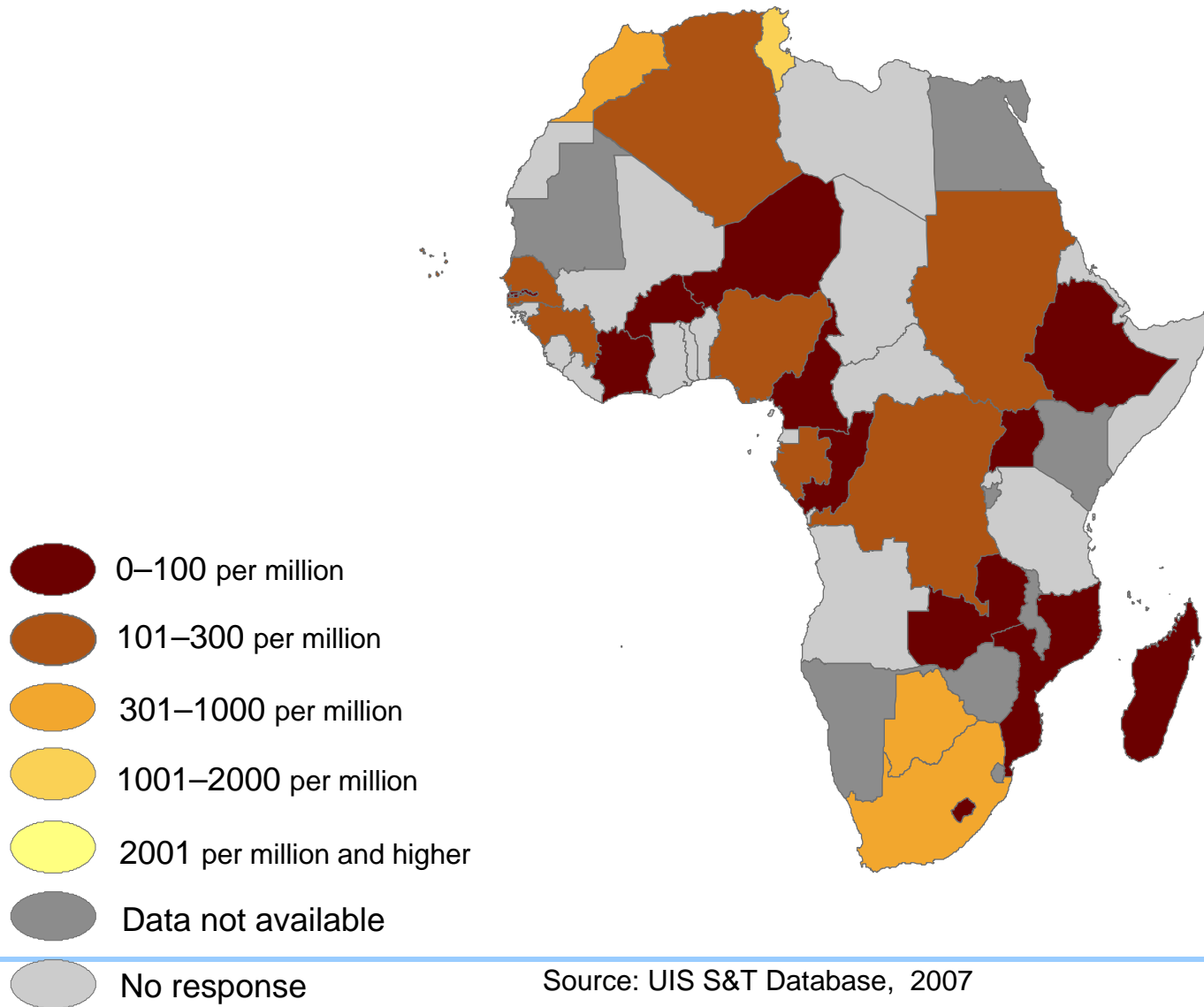
FTE: Full-time equivalents, HC: Head count instead of Full-time equivalent, * Based on partial data

R&D Personnel, Africa, 2007 or last available year (cont.)

Country	Year	Researchers (FTE)	Researchers per million inhabitants (FTE)
Madagascar	2007*	937	48
Morocco	2006* (HC)	28,089	910
Mozambique	2006* (HC)	337	16
Niger	2005*	101	8
Nigeria	2005* (HC)	28,533	202
Sainte Hélène	2000*	2	...
Senegal	2007* (HC)	3,277	265
Seychelles	2005*	13	157
South Africa	2005	17,303	361
Sudan	2005 (HC)	11,208	304
Tunisia	2006	15,833	1,550
Uganda	2007 (HC)	891	29
Zambia	2005* (HC)	792	69



Researchers per million inhabitants, 2005 or latest available year – Africa



Source: UIS S&T Database, 2007



Gross Domestic Expenditure on R&D (GERD) indicators in Africa, 2007 or latest available year

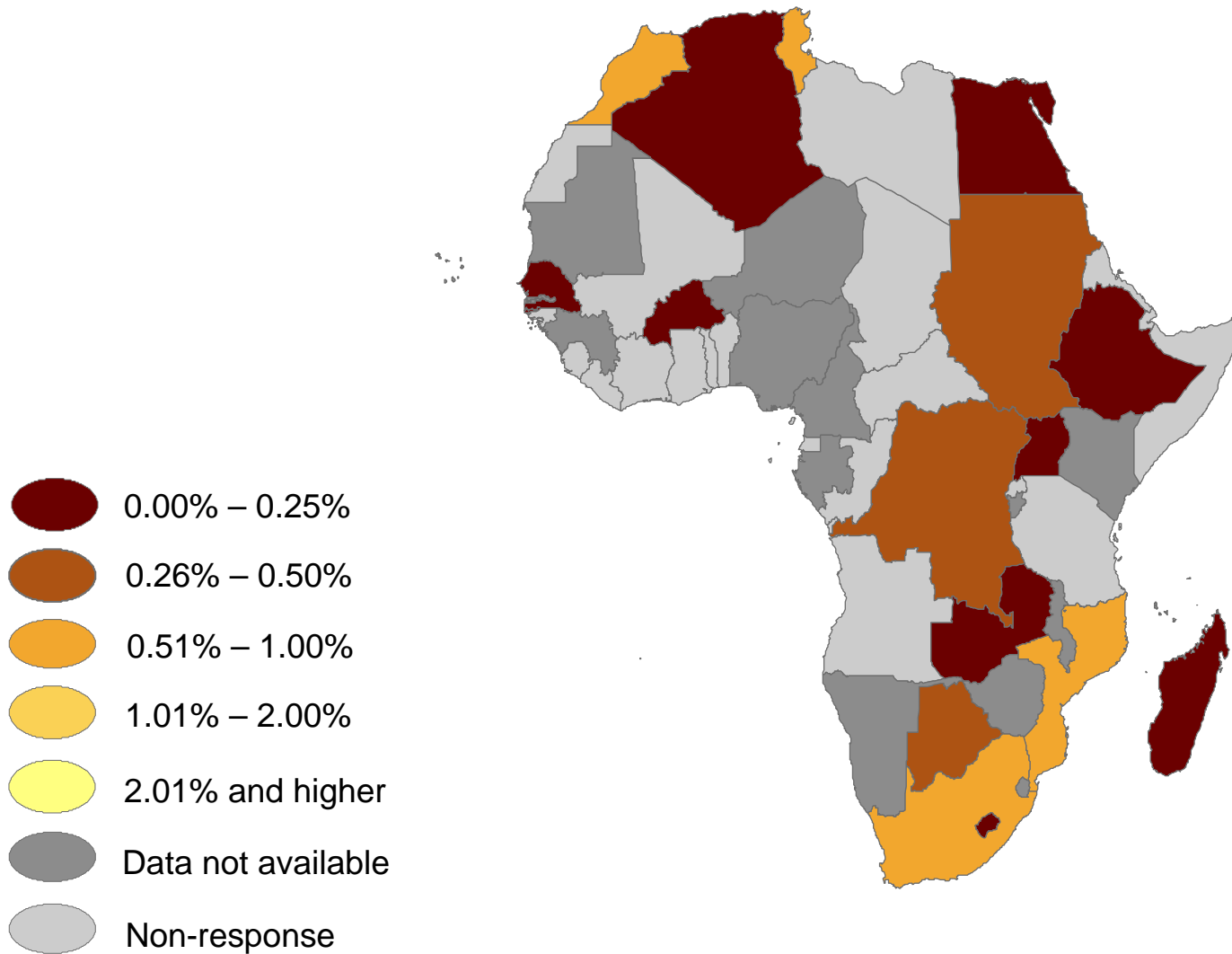
Country	Year	GERD ('000) – Local currency	GERD - PPP\$ ('000)	GERD – as % of GDP	GERD per inhabitant (PPP\$)
Algeria	2005*	4,994,000	133,360	0.07%	4.1
Botswana	2005	205,567	84,916	0.38%	46.3
Burkina Faso	2007*	3,589,972	18,392	0.11%	1.2
D.R. of Congo	2005*	16,116,424	75,217	0.48%	1.3
Egypt	2007*	1,680,000	927,917	0.23%	12.3
Ethiopia	2007*	296,174	106,791	0.17%	1.3
Lesotho	2004*	5,400	1,552	0.06%	0.8
Madagascar	2007*	19,314,787	25,862	0.14%	1.3
Mauritius	2005*	690,030	47,014	0.38%	37.9
Morocco	2006	3,670,080	761,726	0.64%	25.0

Gross Domestic Expenditure on R&D (GERD) in Africa, 2007 or latest available year (cont.)

Country	Year	GERD ('000) – Local currency	GERD - PPP\$ ('000)	GERD – as % of GDP	GERD per inhabitant (PPP\$)
Mozambique	2002	501,580,800	52,267	0.50%	2.7
St. Helena	2000*	51,156
Senegal	2005*	4,090,000	16,252	0.09%	1.4
Seychelles	2005*	15,271	4,551	0.38%	54.9
South Africa	2005	14,149,239	3,654,269	0.92%	76.2
Sudan	2005	19,284,000	179,085	0.28%	4.9
Tunisia	2005	384,000	660,607	1.02%	65.4
Uganda	2007	82,248,923	119,654	0.41%	3.9
Zambia	2005*	9,272,025	3,840	0.03%	0.3

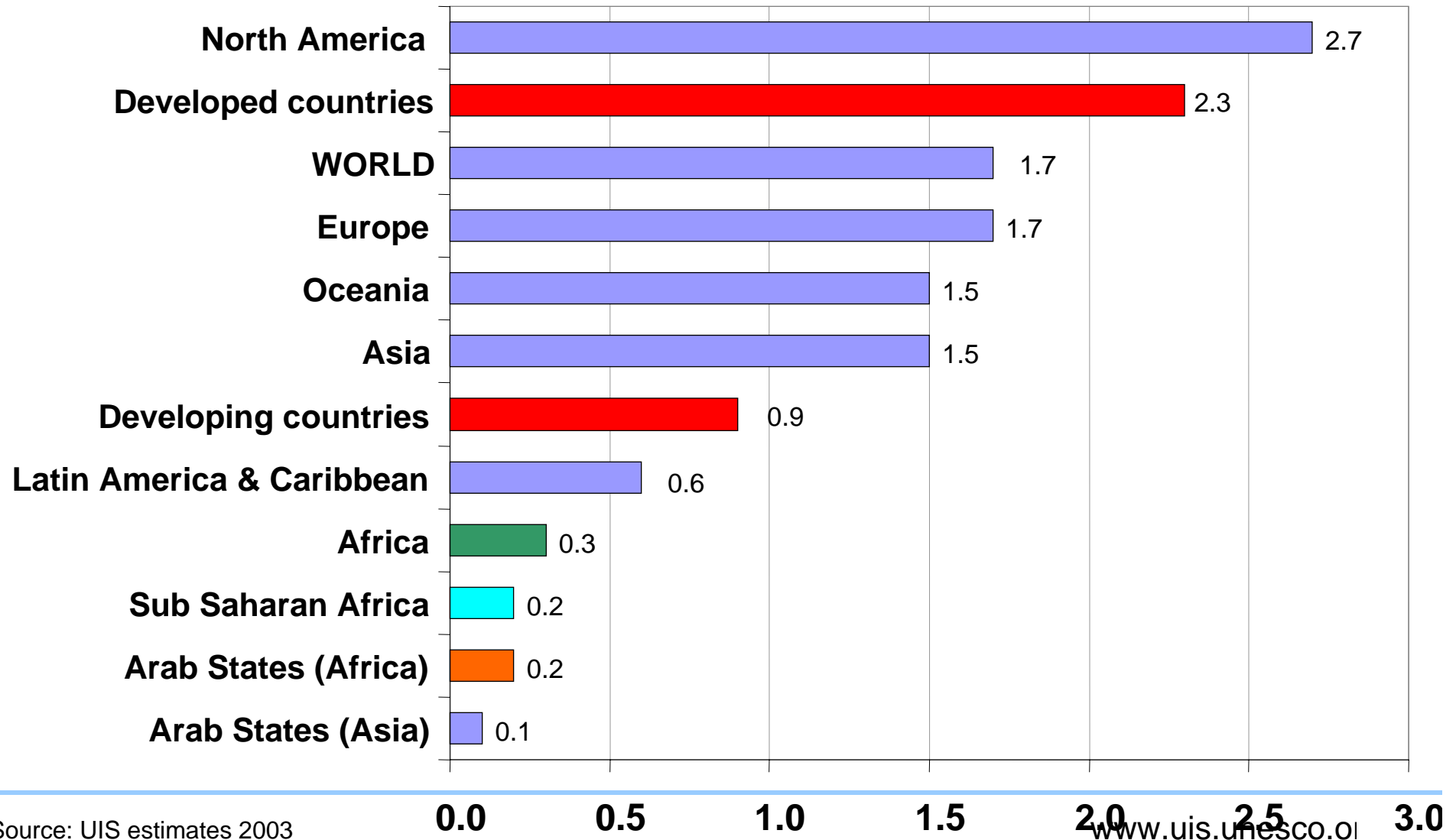


GERD as a percentage of GDP, 2005 or latest available year - Africa



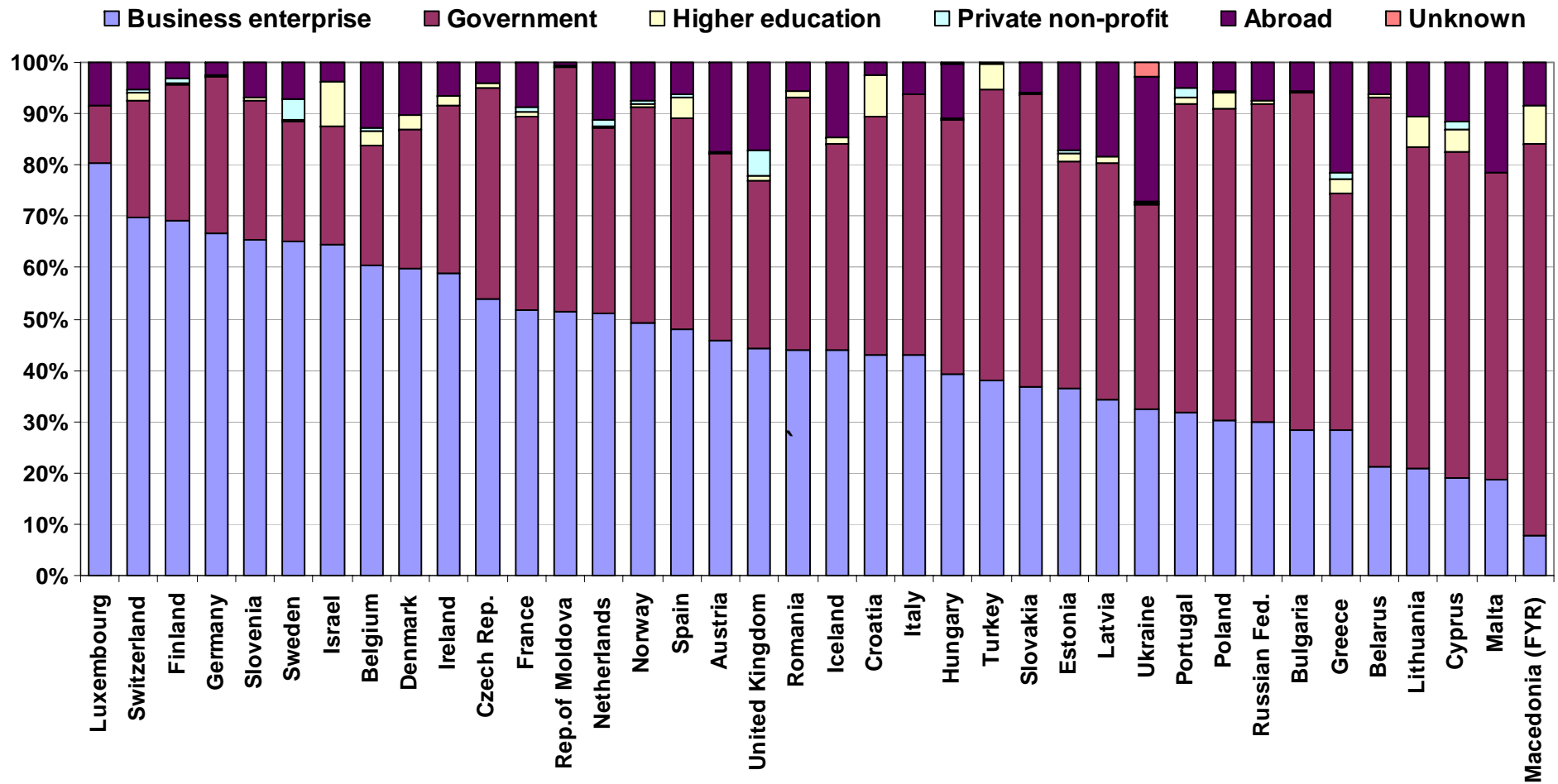
GERD as a percentage of GDP in 2000 by principal regions/sub-regions

Developing countries spent around 0.9% of their GDP on R&D, still falling short of the target of 1% indicated in various S&T Policy documents

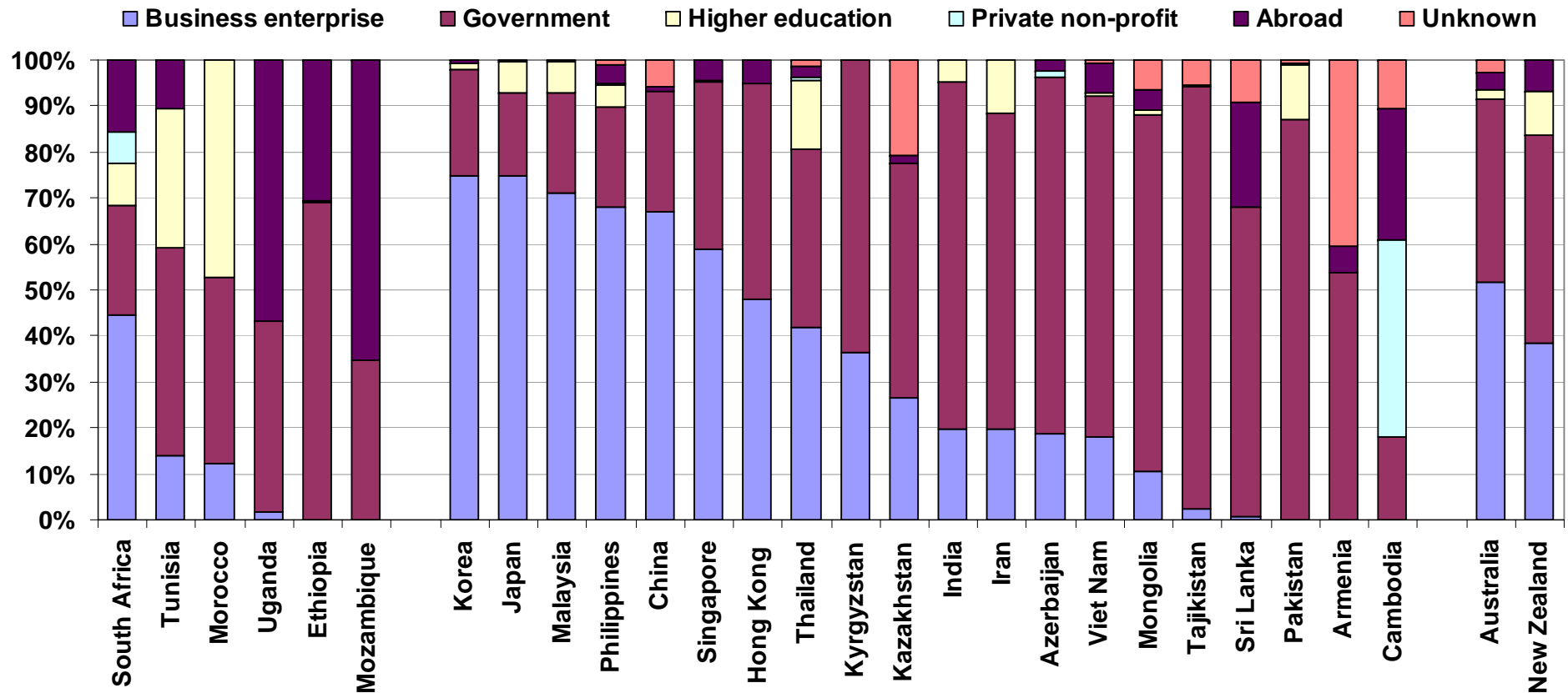


Funding in Europe.

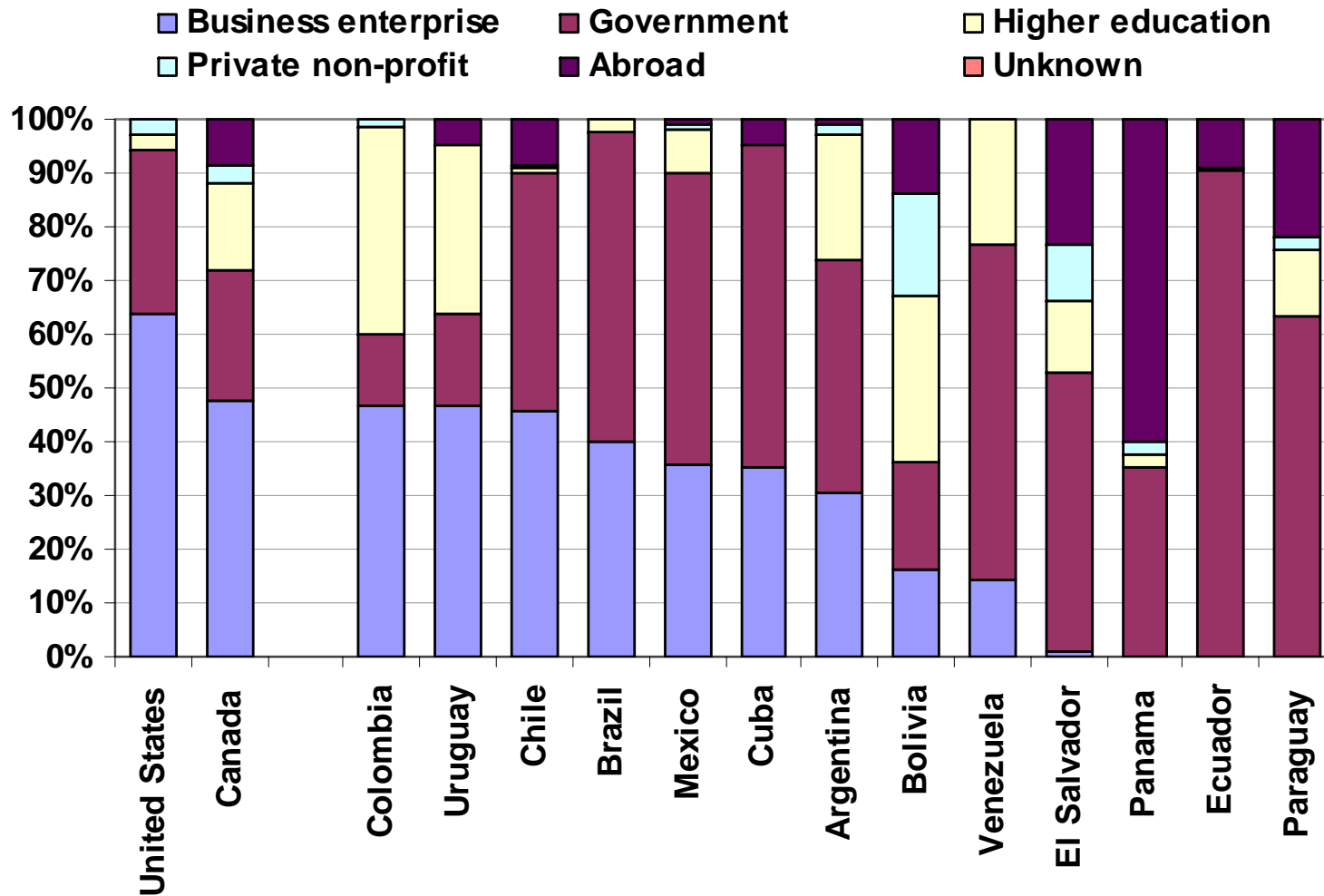
GERD by source of funds, 2005 or latest available year



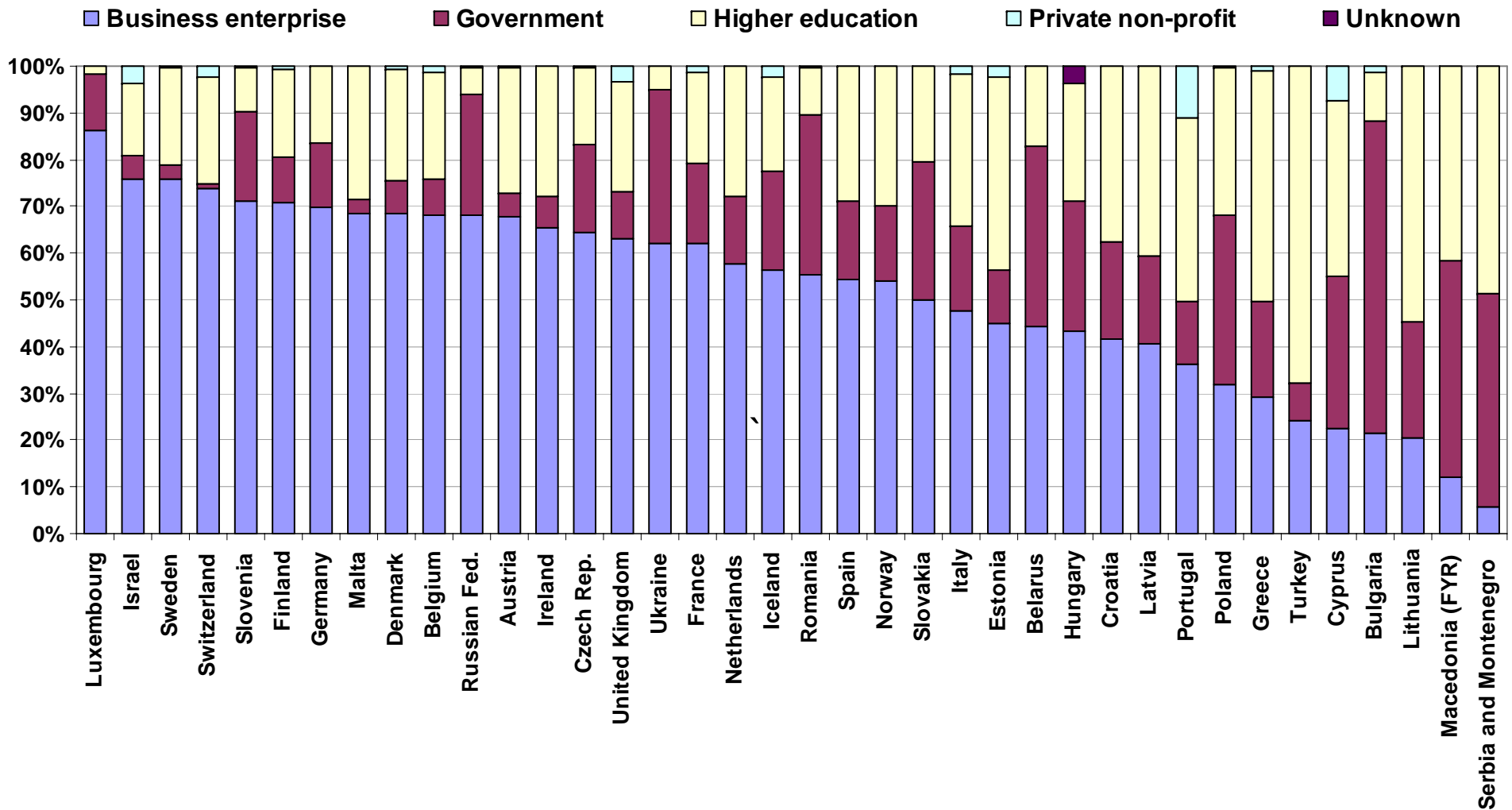
Funding in Africa, Asia and the Pacific. GERD by source of funds, 2005 or latest available year



Funding in the Americas. GERD by source of funds, 2005 or latest available year

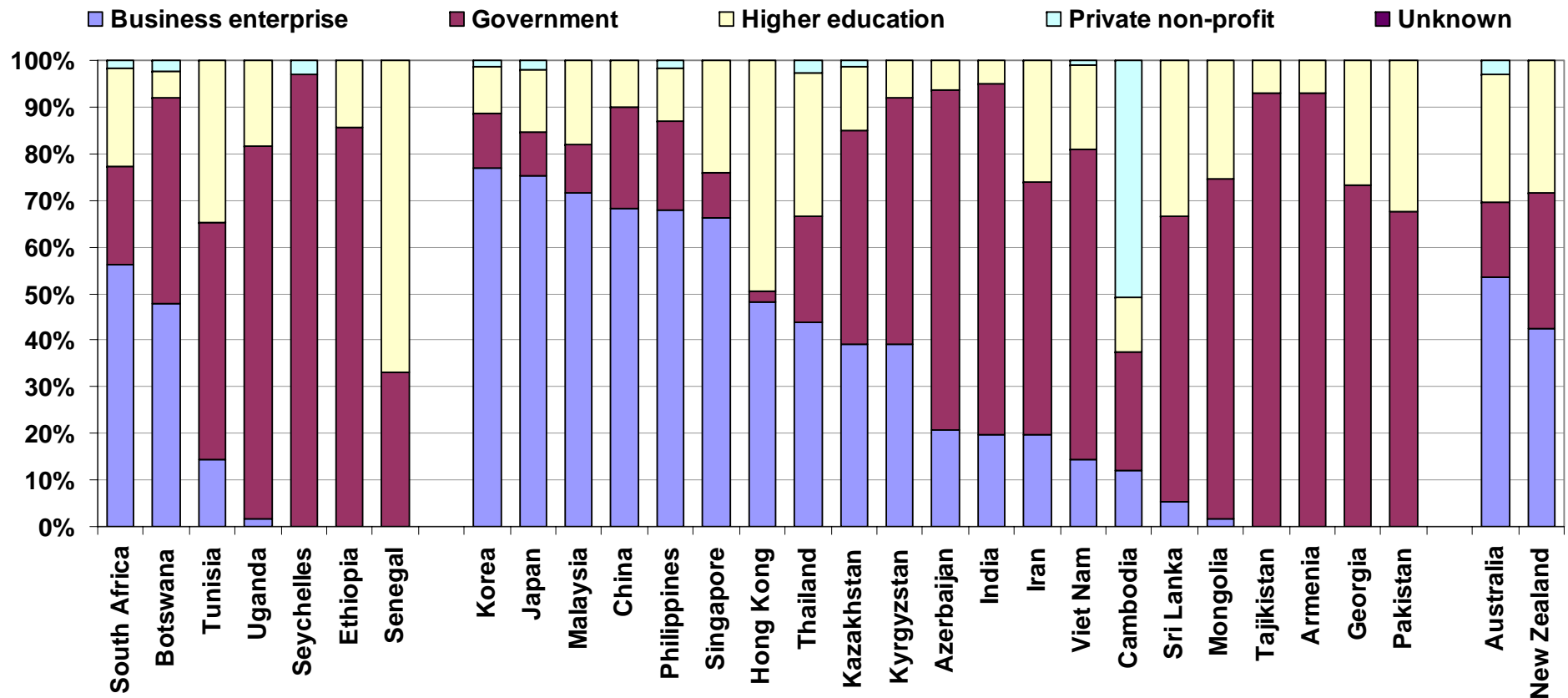


A breakdown of R&D investment in Europe. GERD by sector of performance, 2005 or latest available year

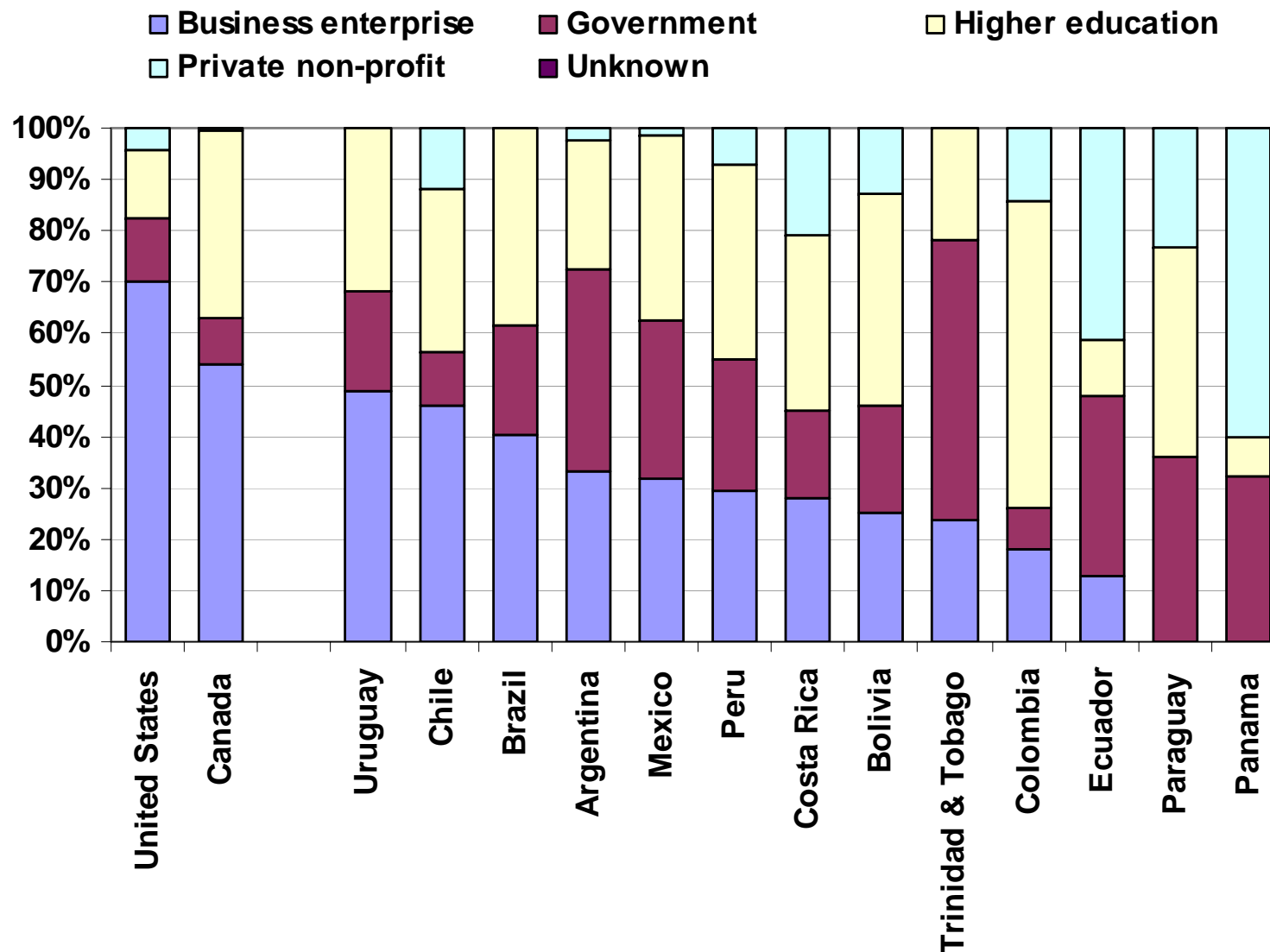


A breakdown of R&D investment in Africa, Asia and the Pacific.

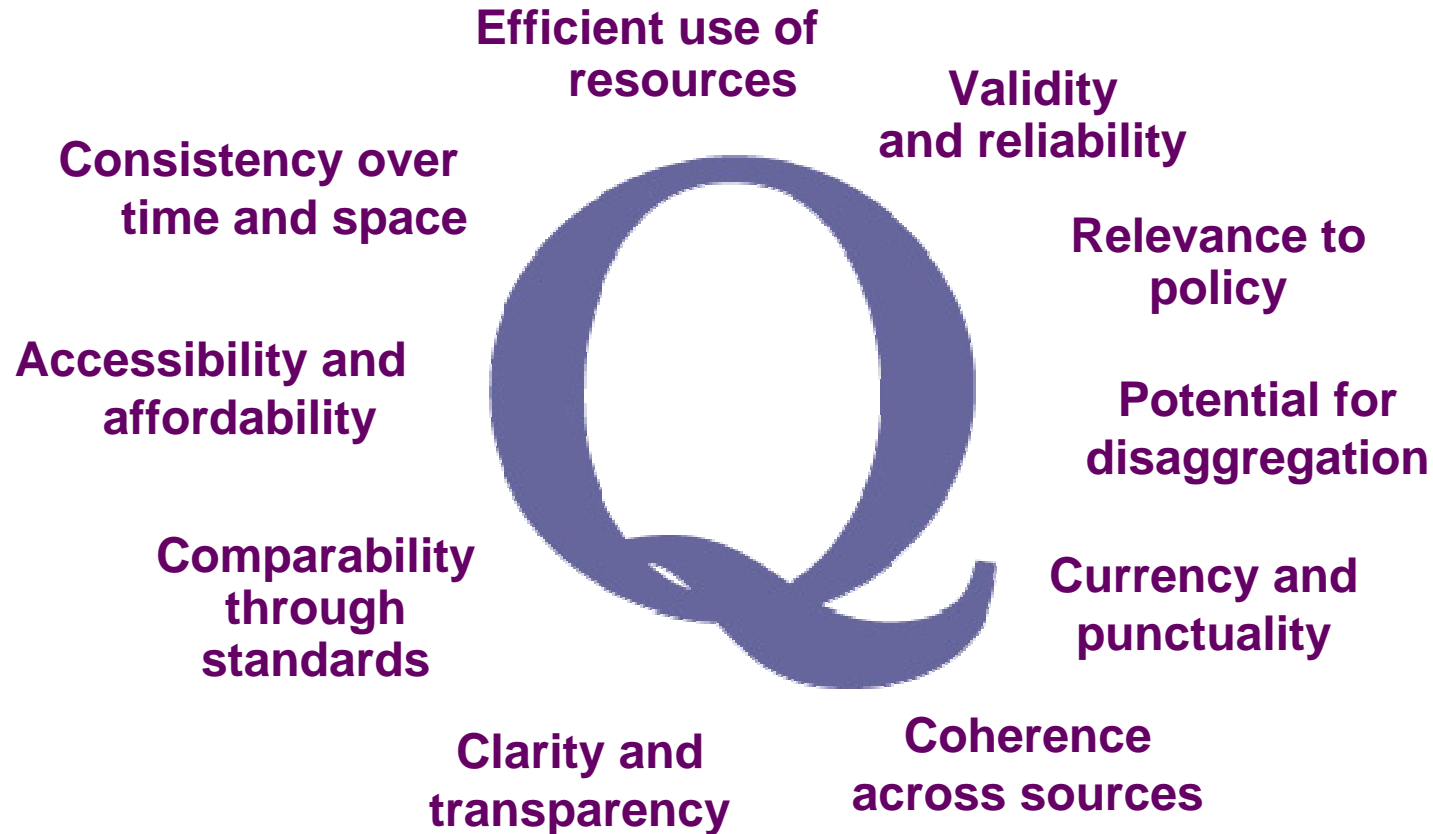
GERD by sector of performance, 2005 or latest available year



A breakdown of R&D investment in the Americas. GERD by sector of performance, 2005 or latest available year



Quality of data





S&T Statistics Workshops

The problem:

- Production of S&T statistics in many developing regions (including, but not only, in the Arab States) remains low. Capacity building is needed.

UIS Response: Regional workshops

- To increase the number of countries regularly producing quality S&T indicators.
- To create local capacities for the production of such indicators, with the final aim of establishing sustainable local S&T statistics systems
- To promote the use of S&T indicators, seeking comprehension for evidence-based S&T policy making.
- To share experiences with other developing countries in the field of S&T indicators, and to address the problems that countries may have encountered in collecting S&T statistics.
- To gain knowledge about the particular characteristics of S&T statistics data collection and use in the context of countries in the same region.
- To generate initiatives that could be used as a demonstration for good practices in other countries of the region.



S&T Statistics workshops:

- 1. Southern and Eastern Africa – Uganda, Sept. 2005**
- 2. South Asia – India, Nov. 2005**
- 3. South-East Asian – Indonesia, March 2006 (with ISESCO)**
- 4. Francophone Sub-Saharan Africa – Senegal, Oct. 2006**
- 5. Central Asia – Kazakhstan, November 2006 (with ISESCO)**
- 6. MEDA, Francophone – Tunisia, January 2007 (with EU-Medibtikar)**
- 7. South-East Europe: FYR of Macedonia, March 2007**
- 8. MEDA, Anglophone – Jordan, April 2007 (with EU-Medibtikar)**
- 9. Latin America – Brazil, May 2007 (with RICYT)**
- 10. Eastern Europe – Moscow, Sept. 2007**
- 11. Central Africa (Francophone) – Cameroon, Nov. 2007**
- 12. Gulf Countries – Oman, May 2008**
- 13. South-East Asian – Cambodia, Nov 2008 (to be held)**



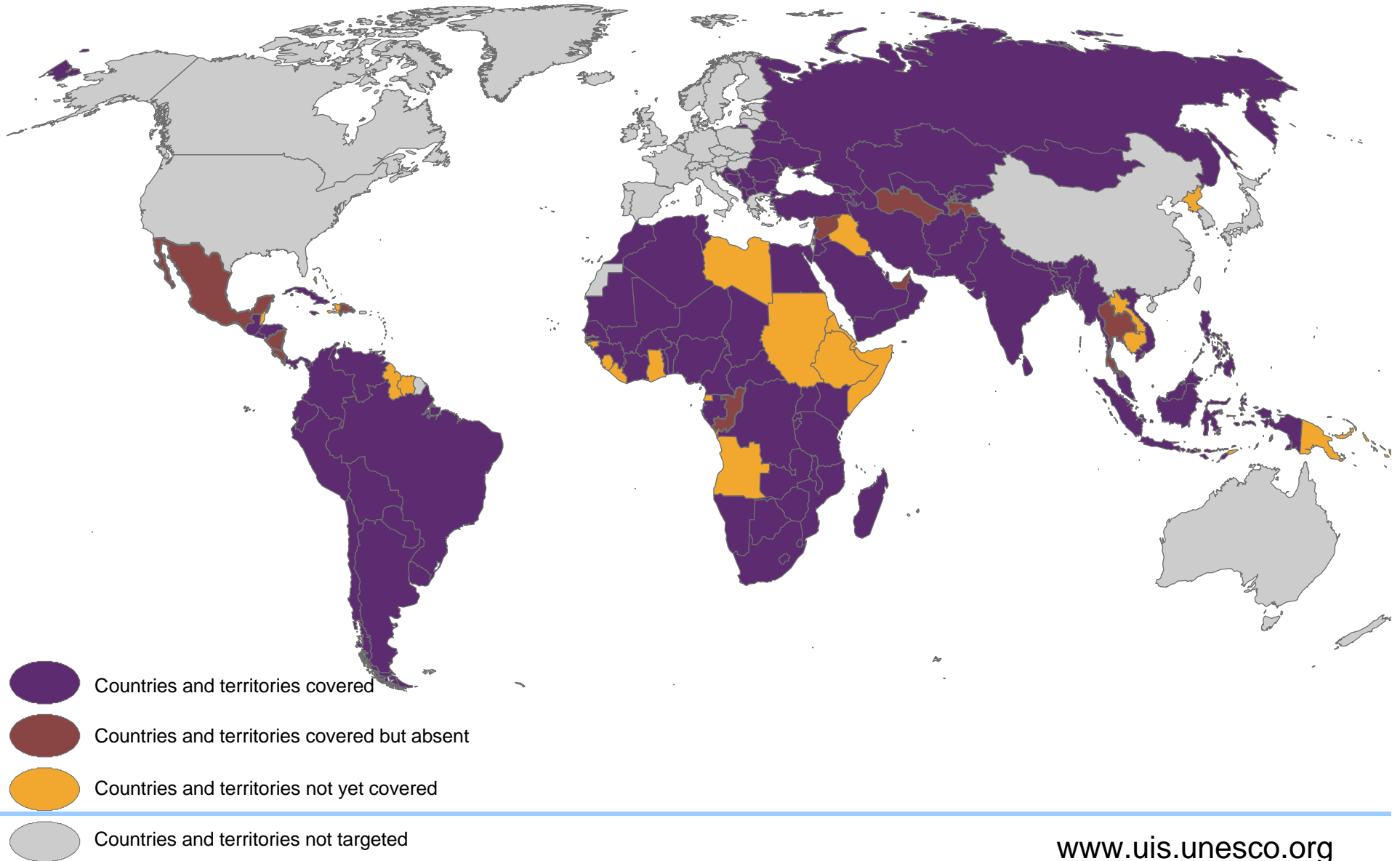
Countries participating in UIS S&T Statistics workshops 2005-2008

Region	Countries (Total: 89)
Africa	35: Algeria, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape-Verde, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of Congo, Egypt, Gabon, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.
Asia	24: Afghanistan, Armenia, Azerbaijan, Bangladesh, Bhutan, Georgia, India, Indonesia, Iran, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Palestinian Authority, Philippines, Sri Lanka, Uzbekistan, Vietnam.
Latin America & Caribbean	17: Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela.
Europe	13: Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, FYR of Macedonia, Moldova, Montenegro, Romania, Russia, Serbia, Turkey, Ukraine.

Results of workshops

- Increased response rate – non-responding countries learn how to do it from UIS and neighbours
- Immediate problems solved.
- Increased data quality – improved understanding of application of international standards
- Face to face contacts = more effective networking
- Inputs to UIS programme development

Countries and territories that have participated in UNESCO S&T Statistics workshops 2005-8





Standard setting/Methodological developments:

- Careers of Doctoral Holders – CDH
- Measuring Innovation in Developing countries: Annex to the Oslo Manual (2005).
- Measuring R&D in Developing countries: Annex to the Frascati Manual (2008/2009).

- Response to ‘brain drain’ data demands from policy makers and analysts.
- Joint UIS/OECD/ EU project, funded by NSF
- Agreed output (OECD), method (EU), and questionnaire (UIS)
- Result; common ‘toolkit’ available to countries:
<http://www.oecd.org/dataoecd/6/25/39811574.pdf>
- Pilots EU. Argentina.
- International meeting on CDH, Dec 2008

- Further development of CDH
 - Piloting and implementation
 - Extension to 'Masters' level, or key occupations
- Continuing interest in women in science

UIS approach to R&D statistics

- Applying Frascati Manual (FM) as much as possible. **The use of international standards is of foremost importance for comparability of data within and throughout regions.**
- Disseminate the FM methodology through workshops
- **Develop new guidelines (Measuring R&D in developing countries)**, by listening to countries (e.g. in workshops); being attentive to issues where the FM is not suitable for developing countries; and looking for solutions together with the country professionals.

Measuring R&D in developing countries

- OECD Frascati Manual is widely accepted International standard practice for surveys on R&D.
- However, application of Frascati Manual concepts are not straight forward in developing countries.
- UIS is engaged in developing new guidelines on measuring R&D in developing countries, compatible with Frascati Manual .

- Identified as 2nd phase of UIS strategy
 - (UIS S&T strategy 2003, MTS 2007)
- Metadata and basic indicators collection proposed
- Collaboration with OECD



Some publications

- Data publicly available at: www.uis.unesco.org
- **UIS Publications** (can be downloaded from the UIS website):
 - S&T Bulletin 1 – Investment in R&D;
 - S&T Bulletin 2 – Bibliometric Indicators;
 - S&T Bulletin 3 – Women in Science
 - Fact sheet: R&D statistics
- **UNESCO Science Report 2005**
- **International Report on Science, Technology and Gender 2007**
- **UNESCO World Report**
- **History of Science Statistics at UNESCO**
- Paper on 'current status of International Science statistics for Africa' in African Statistical Journal



Collaborations / Partnerships

- UNESCO HQs
- World Bank
- Eurostat
- AU
- ADB
- ATPS
- ISDB
- EU-Medibtikar
- IDRC (Canada)
- IRD (France)
- UNESCO offices worldwide
- OECD
- RICYT (Latin America)
- ALECSO
- Arab Academy of Science
- ISESCO
- Inter-Academy Council
- INRS (Quebec, Canada)
- ASEAN



Way forward in Africa

- There is still a lot to do!
- Looking forward to further cooperation with AU.
- Avoid duplication of data collection.
- UIS needs to keep direct contact with statisticians:
Quality and relevance.
- Input for Frascati Manual adaptation project (ongoing).
- Countries to establish **sustainable S&T statistics systems**, involving line ministries (S&T Ministries or Research Councils) and National Statistical Offices.



Thank you!

<http://www.uis.unesco.org>

**UNESCO Institute for Statistics
C.P. 6128 Succursale Centre-Ville,
Montreal, Quebec, H3C 3J7,
Canada.**

Telephone: (1-514) 343-6880

Fax: (1 514) 343-6872