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United Nations
Educational, Scientific and
Cultural Organization

Organisation
des Nations Unies
pour l'éducation,
la science et la culture

UNESCO Forum on Higher Education, Research and Knowledge

The Comparative Analysis of National Research Systems

Report of the Symposium

UNESCO, Paris, 16-18 January 2008

Contents

Section 1

Introductory Note

- **The Brief**

The UNESCO Forum's *Special Initiative: Comparing National Research Systems* is intended to learn more about national research systems in developing countries in order to help strengthen their capacities to better manage their development processes. The project supports research on and for development so that these countries may clearly articulate and have ownership of their systems, which are key assets for their socio-economic progress.

This process relies heavily on scientific and intellectual dialogue to articulate and enhance the links between higher education, research and knowledge. Despite trends towards increased levels of global uniformity, there exits no single answer to what constitutes the most appropriate structures, systems or policies for research and knowledge production. In the search for effective responses, the links amongst policies for higher education, science and social development assume special importance.

- **The Content**

For the Symposium (UNESCO, Paris, January 16-18 2008), the data presented of a global meta-review and country review template , regional reports and country studies of 52 middle and low income countries.

The countries studied were:

- Africa (17 countries) Benin, Botswana, Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Kenya, Malawi, Mali, Nigeria, Senegal, Tanzania, Uganda, Zambia
- Arab States (12 countries) Algeria, Bahrain, Egypt, Jordan, Kuwait, Lebanon, Morocco; Oman, Sudan, Syria, Tunisia, United Arab Emirates
- Asia (10 countries) Bangladesh, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Singapore; Sri Lanka, Thailand, Vietnam
- Latin America/Caribbean (13 countries) Argentina , Bolivia, Chile, Colombia, Costa Rica, Cuba, Ecuador, Jamaica, Mexico, Panama, Peru, Trinidad and Tobago, Venezuela

The Country Template is intended to function as a tool for countries to assess their own systems and to compare these with others of similar scale.

- **The Methodology**

The principal purpose of the Special Initiative is the methodology.

Mapping is a strategy currently used by a significant number of organizations in various fields which are vital for development. For this reason, partners such as NEPAD, WHO, FAO and related health organizations, and the OECD were invited to the Symposium to share their methodologies in key areas of knowledge systems such as agriculture, health, science, technology and innovation (STI) and higher education.

Regarding the Country Template, suggestions for its final format were duly noted, including the addition of a tenth indicator entitled *Tensions, Dynamics and Challenges.* In this way, its use as a tool for analysis may be enhanced.

- **Possible Applications**

Piloting of the country template, either in it's entirely or regarding selected components may be undertaken by the UNESCO Forum on an academic basis to assess its applications. As well, this will be available to countries to help them map and analyse their knowledge systems as part of their policy –making exercises.

- **The Special Initiative within the programme of the UNESCO Forum**

The UNESCO Forum is an arena for the promotion and debate with regard to "research on research" and knowledge systems. It is global, regional and national in scope, and operates in partnership with multiple expert bodies. The Special Initiative, which focuses on the analysis of country research capacities , fits within the Forum's overall matrix of diverse activities (*inter alia*, the Global Colloquium, the Global Research seminar, regional research seminars and commissioned research papers). It can thus benefit from its programme of broader debate, analysis and prognostic advice on systems of higher education, research and knowledge in the 21st century.

Section 2
Summary Report of the Rapporteur General: Key issues

I. Introduction

While knowledge societies are growingly emerging on a global scale, research systems are expected to play a key role in their shaping and development. However, there is a large diversity between countries in terms of their research systems development. In order to acquire a better documented image of this diversity, a mapping of research systems of low income countries was considered as both desirable and relevant.

I. 1. Purposes

i) Launching a flexible template with appropriate indicators that may be used by those countries interested in mapping their research and knowledge systems, comparing them on a wider scale, and identifying priority needs for policy making and capacities strengthening.

ii) In order to do so, two activities have been undertaken:
- Mapping of research and knowledge systems from middle and low income countries, with special emphasis on national policies, infrastructure, human capacities, and investment.
- Comparing these research and knowledge systems in order to finally allow each country to see itself in a wider context and to identify areas for further policy actions.

I. 2. Contexts and underlying assumptions

i) Contextual challenges

- A new economy:
  - Emerging and developing knowledge societies and economies:
    - Expectations for S&T are today higher than in any other time in history
    - S&T the main driver of economic growth
    - S&T create new markets and employment opportunities, new culture of development

- Global waves

  - Globalization, with its opportunities, risks and uncertainties, generate a new context:

    - Liberalized world trade
    - Increased competition
    - New international division of labor
    - Knowledge intensive industries and focus on innovation

ii) Risks (global, regional, national):

- Increased inequalities (social, economic, etc.)
- Growing insecurities (personal, environmental …)
- Emerging conflicts (ethnic, political …)
- New threats and dangers (environmental, industrial, …)

In such contexts, there is a growing need to ensure for all the peoples an *equitable access to knowledge, innovation and development*. Thus symposium facilitated this by providing an appropriate methodology for mapping national research and knowledge systems, particularly from low and middle income countries.

II.1. Outcomes

Two tracks of discussions emerged in the Symposium:
(a) knowledge on S&T systems
(b) knowledge on how to get knowledge about S&T systems

Sometimes the two tracks were parallel, even divergent; indigenous knowledge vs. external knowledge; reliable knowledge vs. unreliable knowledge. However, most of the time, the discussions were highly convergent. It is out of this convergence that apparently we managed to agree on a set of general trends and developments in the research systems of low income countries.

II.2. Substantive outcomes

- Significant diversity and important differences between national and regional research systems.

- A growing "knowledge deficit" is affecting low income countries as the result of:

  - de-institutionalization of research structures
  - de-professionalization of existing researchers
  - weak connection between research and higher education
  - emigration of talents (brain-drain)

- A high correlation between knowledge production and economic output both being low

- Low public investment in knowledge production

- Low public trust in locally produced knowledge

- Poor research infrastructure and poor research ethos

- Information on research systems not easily available, less systematic, even non-existent

- Science policy, when existing, is loaded with rhetorics and bears almost no impact on the reality of development

II.3. Methodology of mapping research systems

1. Reviewing (mostly practiced nationally and by such agencies as OECD)

Modality:

- Description
- Interpretation
- Evaluation
- Prescription

Lacking explanation

Criteria:

- focused on research policy
- focused on that development which is based on knowledge
- focused on getting knowledge about research systems

2. Meta-reviewing

- Reviewing regionally and globally country reviews for:
  - Comparative reasons
  - Identifying major global and/or regional trends and issues
- Take a critical stand on country reviews and suggest a new agenda for reviewing
- Testing reviewing templates

II.4. Dilemmas and/or complementarities

When comparing reviewing and meta-reviewing methodologies, certain dilemmas and/or complementarities should be considered:

- Indigenous and/or external reviewing
- Internal and/or external reviewing and/or meta-reviewing
- Knowledge for knowledge sake and/or knowledge for policy making
- Quantitative indicators and/or qualitative (narrative) descriptors
- Primary *vs.* secondary analysis
- Country and/or region/global reviewing
- Focus on demand for research and/or focus on supply of research

II.5. Key methodological issues

The participants seemed to favour that reviewing methodologies which:

- Allow for context dependency, providing opportunities for getting not just national, but also regional and global perspectives
- Built-in flexibility: one size does not fit all countries within any region
- Pay attention to historical and cultural factors which are nationally embedded
- Use indicators which would allow for underlying both individuality and commonness of research systems
- Focus on:
    - national and global contexts
    - institutional and national policies
    - organizations for research (public and private, research oriented and academically oriented, related to sectors (agriculture, industry, services, etc.) or more specialized, etc.
    - researchers (communities, cultures, ethos, etc.)
    - governance
    - markets (are there markets for the knowledge and technologies that are locally produced?)
- Provide an open platform for both national and global communication

III. Conclusions

1. The meta-review is in many respects both unique and highly original, since it managed to:
    - provide, more often than not, for the first time, information on research systems from most of the low income countries from all over the world (52 country reviews);
    - provide comparative data on such research systems from a regional and global perspective;
    - test a template with indicators and descriptors for mapping research systems, which has an in-build flexibility and allows for catching out the systems' internal dynamics.
2. The state of research systems in most of the low income countries is a poor one, though regional and country diversity is the hallmark.

3. When existing, science policies are more often than not rhetorical, not well informed or evidence based and reveal major cleavages.

4. There is a range of methodologies for reviewing research systems, but they need improvements.

5. An important agenda of key issues lies ahead with reference to developing research systems in low income countries.

6. The Forum should further follow up such issues:

    - updating information;

    - complement quantitative with qualitative information, indigenous with external information;

    - complement country, regional and global perspectives so as to highlight tensions and conflicts, and provide a dynamic perspective;

    - provide opportunities for cooperation and networking/clustering:

        - between actors within the country (particularly universities, research institutes, economic and political actors …);
        - between countries in the region;
        - on a global scale provided by UNESCO and OECD in close co-operation.

Section 3
Reports on the Sessions

16 January 2008 (Opening Session)

The analyses on national research systems compared at this symposium were those of UNESCO, OECD and NEPAD. Across the three templates, there were positive and negative suggestions and reactions, as well as calls for means of moving forward and better organising future 'research on research'.

- **Positive Aspects**

The main positive aspect evoked was the cooperation and networking already in place. This was evidenced by the presence of Assistant Directors-General from each of the Education, Natural Sciences and Social and Human Sciences Sectors within UNESCO, as well as the presence of OECD and NEPAD representatives. This point was also made by the Director of SAREC/Sida as being an important part of moving forward in this important work, which is, by nature, multi-faceted and intersectoral.

Other positive aspects noted during the meeting were the cooperation that was of benefit to Professors Mouton and Waast during their compilation of data, the originality of some of the country reports, the continuing development of the template and the possibility for scientific policies, even in smaller countries.

The presentations from Ghang Zhang of the OECD, Professors Philippe Mawoko and Claes Brundenius of NEPAD indicated similarities and scope for cooperation between the three research review systems. The themes of benchmarking, a global context and competitiveness (especially in finding niches) are common in both OECD and UNESCO as central issues. NEPAD and the Global Synthesis Report of Professors Mouton and Waast both call for surveys. Professor Brundenius noted the missing link between Research and Industry, an element s which has also been a focus of the UNESCO tool.

- **Aspects for Further Consideration**

The main aspects considered were the trade off between breadth and depth for the template and the consideration of utility and visibility as fundamental tenets of science systems. Practically, there were questions of consistency, under representation of poorer countries and indigenous populations, foreign data collection and other data troubles.

Regarding cooperation questions, Professor Mouton outlined that bibliometric studies have shown a lack of cooperation between a country and its immediate neighbours, instead preferring to enter into joint projects with Northern countries.

- **Moving Forward**

The OECD formula has been used in some way or another for forty years. It would offer something of a goal for the UNESCO formula. The OECD formula suggests much more flexibility and autonomy; it is more recommendation than the UNESCO formula and does not have the same problems of a non-integrated government/science community. Finally there was a question wondering about the lack of a "client" for the UNESCO review: methodology will be influenced by the client. This question was not fully dealt with but there were further statements made suggesting that OECD and UNESCO should have a close working relationship.

17 January 2008 (Morning Session)

AFRICA REPORT

- **Positive Aspects**

There were several positive remarks from the audience in response to the Professor Gaillard's presentation on African research systems. These focussed on the amount of information collected in a short time and the quality of the data. Specific to the region there were positive remarks for the increase in the number of publications and the creation of SANSA (South Africa Network of Skills Abroad).

- **Aspects for Further Consideration**

The remarks made were focussed on the need to standardise data, the low numbers in scientific communities, researchers and institutions, scarce R&D indicators linked to science policies and a need for more qualitative information about scientific activities in some countries. Professor Teng Zeng noted that most of the countries in the study do not fall in the group of Africa's ten largest economies, leading him to wonder how research can be supported. He also differentiated between three levels of brain drain: external, internal and regional, noting that regional brain drain is not as bad a problem and that mobility programmes could be set up for scientists on a regional basis.

Many comments made by the observers added further suggestions. There were problems related to the structure and content of the template. The choice of research topics and priorities, the recruitment process for researchers, explanations behind the facts and figures in the reports and the actual use of the reports now that they have been established were all questioned. There were other questions related to the country situations such as the definition of a scientific community, the necessary creation of a critical mass, the lack of interest in some countries for developing S&T policy and the lack of South-South cooperation.

- **Moving Forward**

Highly qualified expatriates are needed in many of the African countries as well as a need for international cooperation. As concerns the template there will need to be more complete collection of data for certain countries and an increased emphasis on national systems rather than regional concerns.

On major challenge for the UNESCO Forum is how it can continue to grow the Research Community, above all because of the difficulties to obtain relevant documents in some countries even when data are available?

ARAB REPORT

- **Positive Aspects**

The report on Arab states was praised for the amount of data collected. Specific to the region, Professor Benjelloun stated that there is a relatively better situation in Morocco, Tunisia and Mauritania (participants in the Bologna process). In Morocco, some initiatives have been taken against brain drain such as the creation of a website for the exchange of expertise and the creation of a Council of Universities Presidents based on the European model with much more freedom, and decentralised authority.

- **Aspects for Further Consideration**

According to Professor Hanafi, the main problems in the Arab world were mainly to do with the broader question: "Is there a research system with a specific function in the Arab world? " He noted the difficulties in finding data on R&D and S&T especially in the decentralised universities of Egypt, Sudan and Syria, the fact that many private universities do not engage in research, the restrictions Gulf Countries have on foreign students and the problems of brain drain where national scientists abroad can be 4 or 5 times higher than at home.

Professor Benjelloun noted a disconnection between the results of research and their use in the community. He believes that universities should be considered as an agent for social mobility and improvement of the quality of Education and Research but there is a danger in parachuting models that do not necessarily interact with the local university environment. Professor Benjelloun also noted that even if there is free access to most universities, only 35% of students attend them.

Comments from the observers raised three main problems: a democracy deficit, lack of women's empowerment, knowledge deficit. This has led to mistrust in national research, a lack of legal structures/ connection between research and policy and a problematic average level of private institutes.

The observers' remarks on the report itself noted an inaccuracy of data, a lack of interpretation, a lack of distinction between social and technical sciences, the non-existence of indicators surrounding women's participation and a lack of feedback from the countries themselves.

- **Moving Forward**

Any question on moving forward pertaining to the Arab region must address the issue of "what is the return on investment of research productivity?" The Arab world was shown to have undertaken research as a means of development; this is the area which must be addressed.

January 17 (Afternoon Session)

ASIA REPORT

- **Positive Aspects**

Several positive aspects were mentioned. Professor Clemena Salazar suggested that the report was rich in indicators and that there was a diversity of information. There was also positive feedback on the advances that have been made by many of the countries.

- **Aspects for Further Consideration**

Professor Clemena Salazar did however note that it would have been better to have had a more uniform scope in the report, specifically with regard to the context and historical background of each country. Some things were left unclear from the Asian meeting, as evidenced by Professor Arvanitis' questions. These related to the innovations from the region, intellectual property and how it was developed, the involvement of multinationals and where this collaborative work was being done and, finally, public research institutes and their current situation in smaller countries.

- **Moving Forward**

Dr Ikramov, Secretary -General of the UNESCO National Commission for Uzbekistan, suggested that there should be a promotion of school experiences through didactics and wondered to what extent science education is involved in developing research institutes. Finally he suggested that it would be important to include central Asia in the report. Professor Jacob's questions were largely concerned with the quality of data, specifically in relation to transferring research results into policy. She noted there would be a need for a definition of issues and quality as well as creating a reference model.

Professor Kaur Gill noted that there should be another plan for Malaysia. She noted a need to update data, focus on education (primarily moves from social to natural sciences) and references to the cooperation between universities and industries in Malaysia.

Professor Olsson (Sida/Sweden) noted several important issues for the Asian region. She suggested a funding framework, specification of sectors (do they go beyond agriculture?), a balance between funding and cooperation for institutions involved in research and more focus on the poorer countries.

Latin American /Caribbean Report

- **Positive Aspects**

The breadth of the data collected and the attempts to define trends in this diverse region were noted with satisfaction.

- **Aspects for Further Consideration**

There were several issues raised with the LAC country reports. There was call for greater focus on native groups and their institutions (as has been done in the Andean regions), as well as a need for a pilot/model report for each of the country studies; there was need for more discussion about the autonomy of the countries. There was suggestion that Venezuela should be better studied and there was a call for more research into the Caribbean. There were also problems surrounding the methodology: the need to know how to report knowledge, which terms are acceptable and what presuppositions will come out of the use of implicit standards set by the template.

It was further suggested that other indicators can be created especially in the region of measuring outcomes as well as outputs. Indeed several problems were identified concerning the indicators. There are gaps in the indicators, the methodology would need to be extended, the use of indicators and the search for them needs to be highlighted and the indicators should point towards options and realistic goals.

- **Moving Forward**

Finally there were calls to consider science as a political/business issue. There were calls for investment from private sectors as well as perhaps a second template to deal with scientific investment. . It was also suggested that the legitimacy and autonomy of science/research should be taken into account in these country reviews

18 January 2008 (Final Sessions)

Session: Mapping Research on Health Systems

- **Main Points**

The research mapping for health systems was presented as another template/methodology for comparison with the UNESCO template. Though specific to health it had many similarities with the Forum website as well as some strength as a model. As noted by Dr Burke (Global Forum on Health Research), it is very important to compare investments in health in high-income countries. As such there is a multi-level approach, as outlined by Dr Kennedy of the Council on Health Research for Development (COHRED), mapping, profiling, analysis, intervention and evaluation. And as with any other of these mapping systems the main challenge is to quickly move from analysis to action.

Dr Sadana (WHO) presented a mapping and benchmarking toolkit for low and middle income countries, then Dr Gardner (WHO) gave the discussion further context noting that there is a need to evaluate the difference between S&T and Health research communities and eventually a need for unified methodologies. He also outlined a need for a joint push across sectors (agricultural, engineering etc.) to promote research. Further, Sida notes the creation of knowledge networks, evaluation of links and the patterns and outcomes between social indicators. The point was also made that the meetings of experts aren't necessarily always contextual and that the upcoming health meeting in Bamako is a step in the right direction.

- **Aspect for Further Consideration**

According to several observers, there were several areas to develop in the Health Mapping System. Data about Africa, on diasporas, the brain drain and national health policies could be usefully explored.

- **Moving Forward**

It was noted that the priority of health research remained with gathering data now, but by the time of the Global Ministerial Forum on Research for Health (Bamako November 2008) , all the material of WHO will be available.

Session: The Global Met-Review and the Template of Indicators

- **Positive Remarks**

Professor Mouton suggested that this session would allow him to offer clarifications upon the template as well as dispel misconceptions about it. He suggested there would be three categories of responses:

1. Requiring immediate attention
2. Requiring follow-up in the medium term
3. Not requiring any follow-up

He noted the strengths of this review were that it was *wide-ranging* and *novel,* and that the UNESCO template was to be used as an heuristic device to be used critically. He also reaffirmed the need for descriptors and narratives to complement the indicators. Professor Mouton also noted the questions of context such as commissioned/self-initiated reports, diagnostic v. prognostic, descriptive v. analytical etc.

Professor Olsson (Sida/Sweden) made comments to the effect that she was happy with the template, happier still with the discussions and ideas come up with. She also responded to certain concerns over possible fragmentation, emphasizing that the roles of the Forum were diverse.

- **Aspects for Further Consideration**

There were questions raised over several issues from the symposium. They included the countries excluded from the studies, lack of interest in science from many of the countries included and the special circumstances surrounding social science which warrant a separate approach.

Concerning the template there was criticism for the poor coordination across narrative reports done on the same country with Burkina Faso given as an example of receiving three histories of science reports, each having significant differences. There was also suggestion that the word narrative might not be accurate in describing all non-quantitative data and that the template outline similarly suffered from inaccuracy in its guiding structure. There were further questions over fragmentation in the Forum, the possibility for the misapplication of critical mass (leading to application of out of context philosophies to LDC countries), whether science really does help the poor and the absence of Millennium Development Goals as a reference for the study.

- **Moving Forward**

In response to one of the comments made during the symposium about the need to study systems despite the enormous difficulties in collecting relatable data, Professor Mouton suggested that the concept of “good enough” held merit as a response to the question of minimum data quality standards.

Several suggestions for improving the template were made. Professor Mouton considered that the report would benefit from the use of 'emergent' countries as a reference for the others in the same region. He proposed that South Africa be the reference for sub-Saharan Africa, and Brazil for in Latin America. Gender would be incorporated by adding it to more of the indicators and input/output student mobility indicators also ought to be included. A tenth section labelled *Tensions, Dynamics and Challenges*, was also proposed for the template. It is to consider social inscription of science, ethos of science, state and science relations and legitimacy.

Professor Mouton devoted a section of his remarks to consider 'what next?' He considered three stages: taking comments on existing materials, finalizing the report (sources and referencing) and further cooperation with the UNESCO institute of statistics in Montreal. The next option was to consult with statistical agencies. The third was to further purvey the template especially working with NEPAD.

Professor Kjellqvist (Sida/Sweden) offered an "S" graph was offered putting research and development on the axes of a graph suggesting the concurrent but S shaped increase in both. He further suggested the use of specialist mathematicians to enhance this aspect of mapping. There was a question raised by Professor Choucri concerning the possibility for leap-frogging parts of the S curve. She further noted that critical knowledge reminds us that "one size does not fit all".

The knowledge bank referred to by Professors Mouton, Olsson and Arvanitis has been largely termed in being an electronic repository which compiles all data on an interactive framework. There was further suggestion for the template being put on the internet. Such works are the intentions of a tool for policy advice currently begin developed as part of UNESCO's MOST Programme in the Social and Human Sciences Sector.

Section 4
Conclusion

Following this meeting, Professor Mouton and Waast will finalize the country studies and the Global Meta-Review taking into account comments and suggestions of participants.

The Country Template will also be finalized for eventual applications.

This finalization exercise should be completed by July 2008.

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SIFinal Jan2008report7Feb

Symposium on the Comparative Analysis of National Research Systems

Regional Report on Sub-Saharan Africa

compiled by Johann Mouton

comments

by

Jacques Gaillard

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17 Country Reports

- **Botswana, Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mali, Namibia, Rwanda, Senegal, Tanzania, Uganda, Zambia and Zimbabwe (460 Pages)**

- **Benin, the Gambia and Nigeria not compiled**

The compilation benefited from two other major initiatives

- **African Science & Technology Profile** funded by the South African Department of Science & Technology: 22 country profiles completed in August 2007 by CREST and High Impact Innovation (14 country studies were used for the meta review)

- **Science in Africa at the dawn of the 21st century** completed in 2001, coordinated by IRD: 14 country profiles (three in particular were used for the meta review)

Outline of the Report

1. **Introduction**
2. **Summary Indicators and Descriptors**
3. **Summary Findings from the Country Profiles**
    1. **Recent trends in governance and policy development in S&T**
    2. **The institutional landscape: institution-building or de-institutionalization?**
    3. **Current state of human and infrastructural resources**
    4. **Informal S&T structures and scientific communities**
    5. **Knowledge production and output**
4. **Concluding Assessment**

My comments

- **I am impressed …**
- **Bravo!**

My comments

1. **Meta review in Africa and Africa in the rest of the world (research outputs): recent trends?**

2. **Science is as much (more?) concentrated in Africa as in the rest of the world: consequences?**

3. **Science policy in the context of scarce R&D indicators**

4. **De-institutionalisation, de-professionalisation and generation gap?**

5. **Brain drain and the limits of S&T Diaspora.**

6. **International collaboration/cooperation and the limits of national science.**

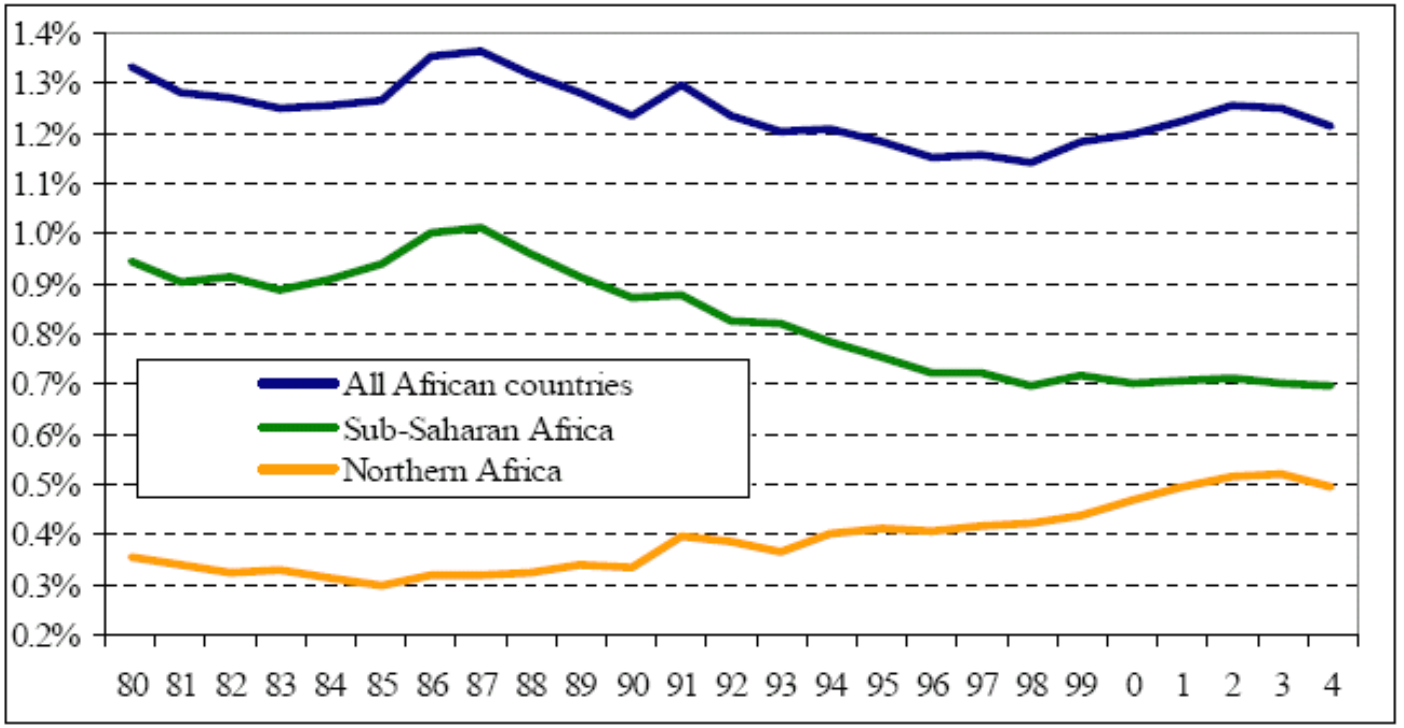
7. **Going beyond macro-indicators and monographs: the need for further studies.**

1. Meta review in Africa and Africa in the world

Research outputs: recent trends

Trends in Africa (1980-2004)

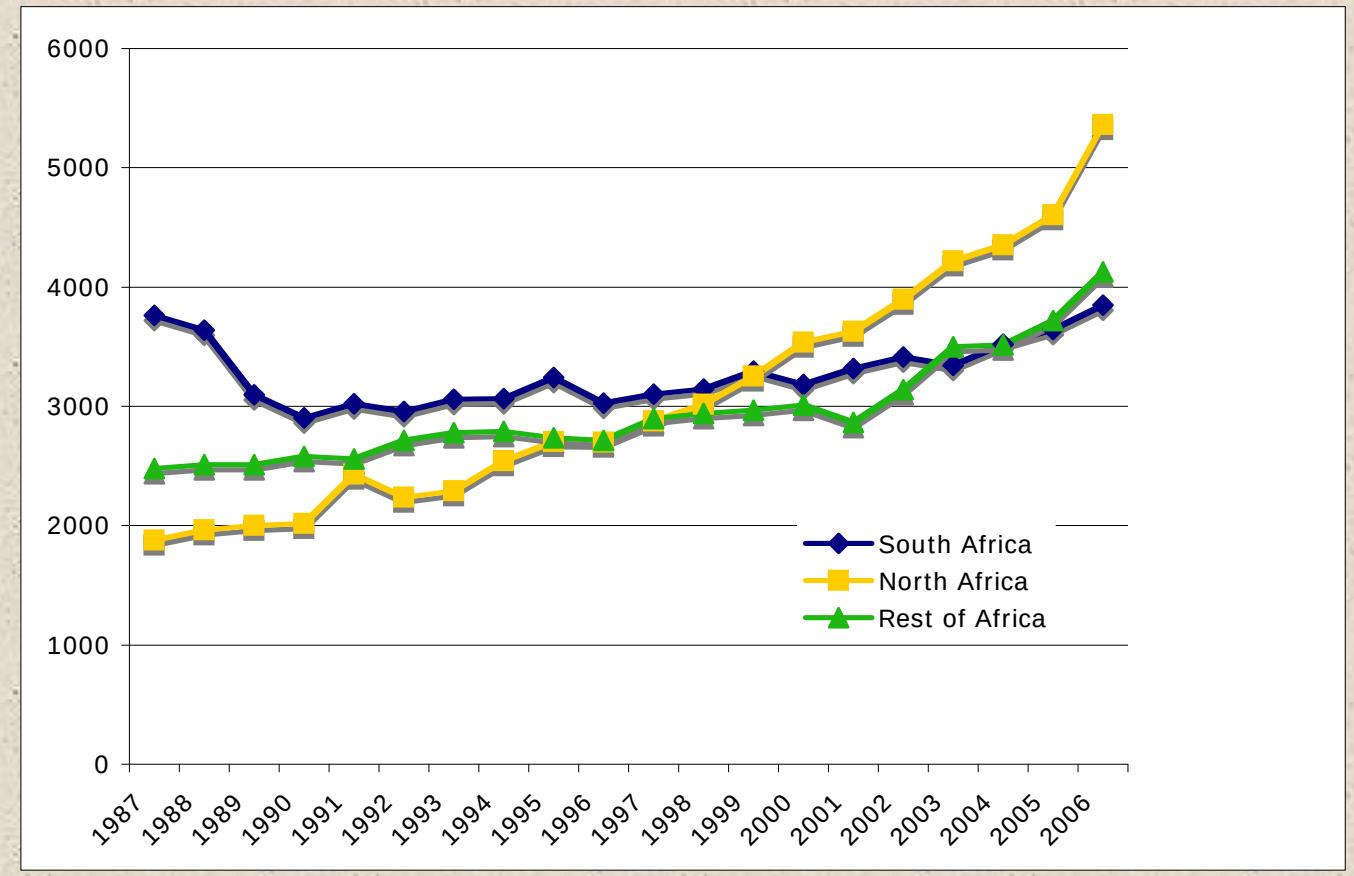
(world share of scientific publications)



Source: CWTS/Thomson Science Citation Index database (excluding the Arts and Humanities Citation Index).

Trends in Africa (1987-2006)

(number of scientific publications)

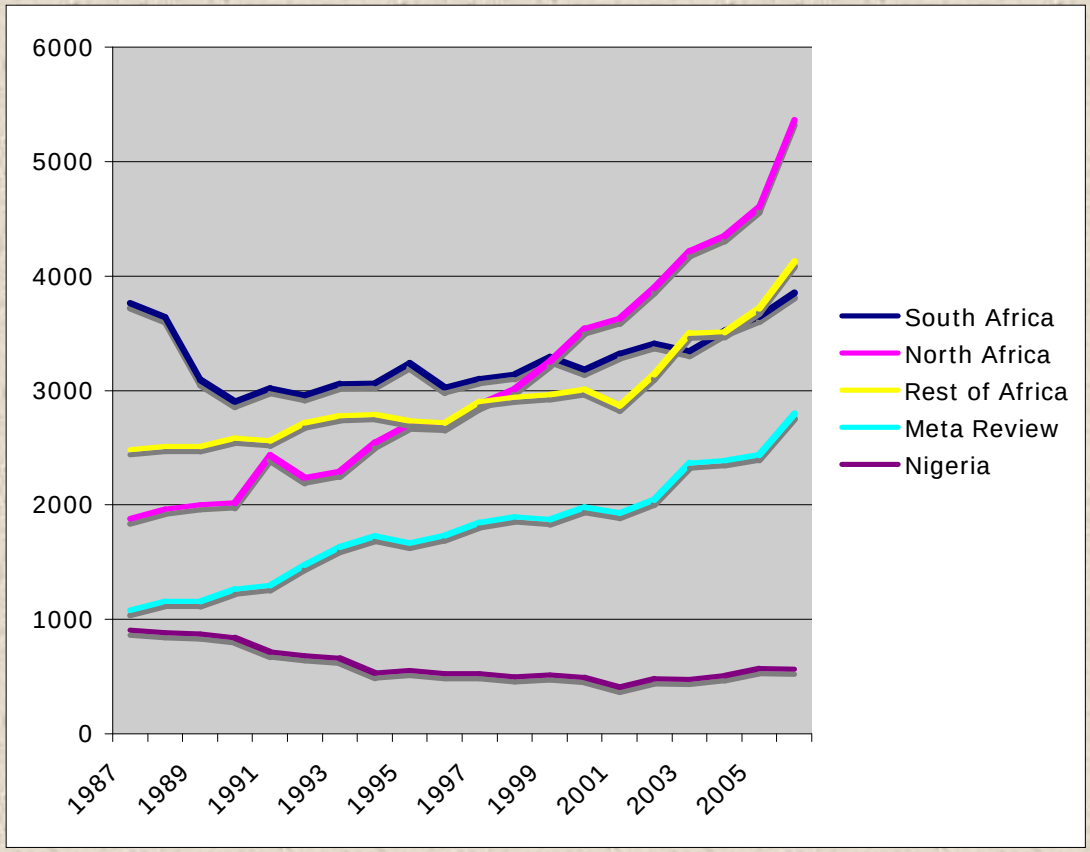


Source: Thomson Scientific data, IRD/P.L. Rossi computing

Trends in Africa (1987-2006)

(number of scientific publications)

Source: Thomson Scientific data, IRD/P.L. Rossi computing



A growing share of Developing Countries except Africa (1999-2004)

Table 2
Scientific production (world share of scientific publications) in Developing Countries

Areas / Countries	World share (%) of scientific publications		
	1999	2004	Evolution 2004/1999
Asia (excluding Japan and Israel)	8.0	12.1	+80
China	2.7	5.2	+89
India	2.1	2.3	+10
South Korea	1.3	2.2	+73
Taiwan	1.1	1.4	+29
Singapour	0.3	0.5	+59
Latin America	2.3	2.9	+27
Brazil	1.0	1.4	+43
Africa	0.9	0.9	-4
South Africa	0.4	0.3	-15
Near & Middle East (excluding Israel)	0.8	1.0	+28
Total Developing Countries	12.0	16.9	n/a

Source : Thomson Scientific data (OST, 2006)

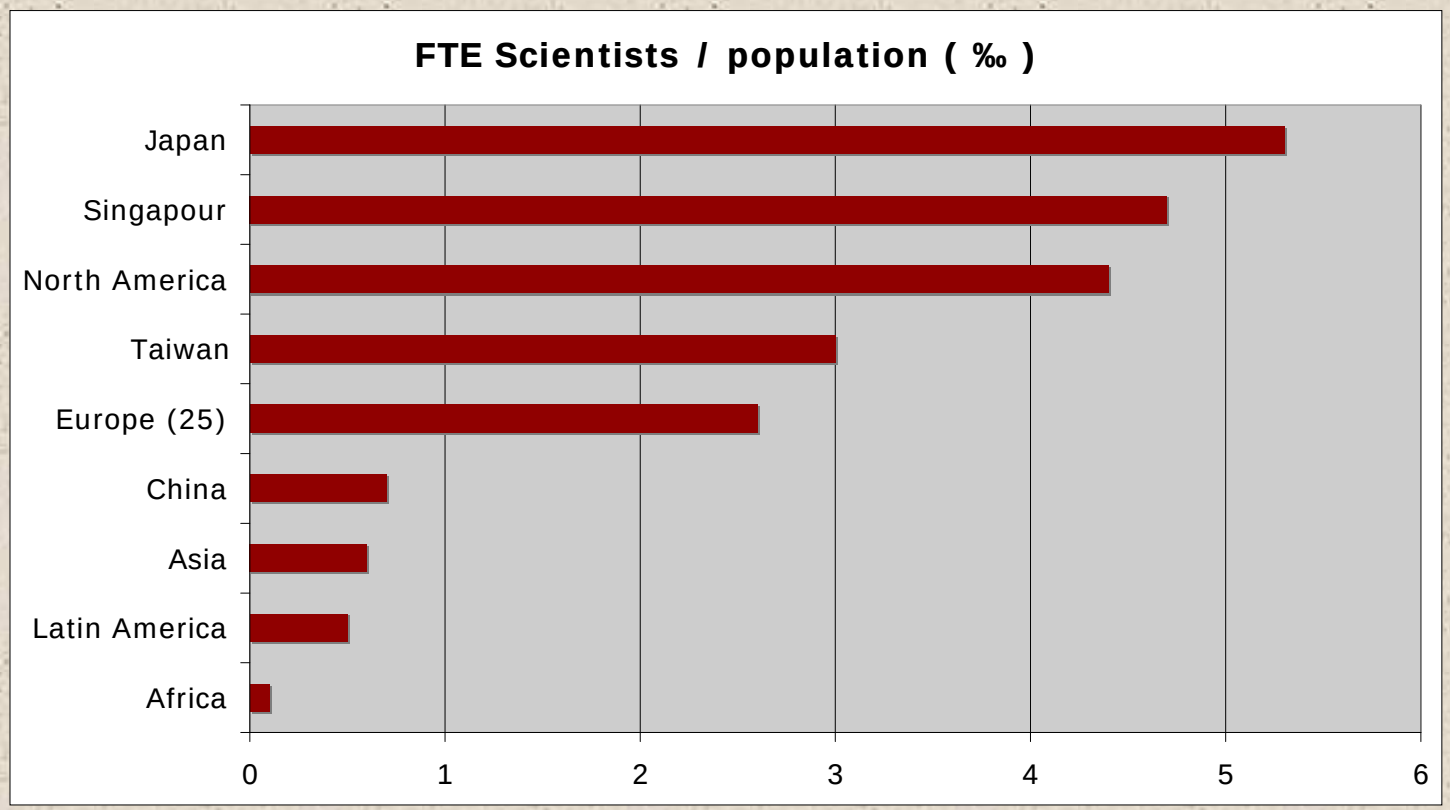
A diminishing world share in the triad countries (1999-2004)

Table 1
Scientific production (world share of scientific publications) in the triad countries

Areas/Countries	World share (%) of scientific publications		
	1999	2004	Evolution 2004/1999
Europe	42.7	40.6	-5
North America	32.9	30.4	-7
Japan	8.8	8.5	-4
Total	84.4	79.5	-6

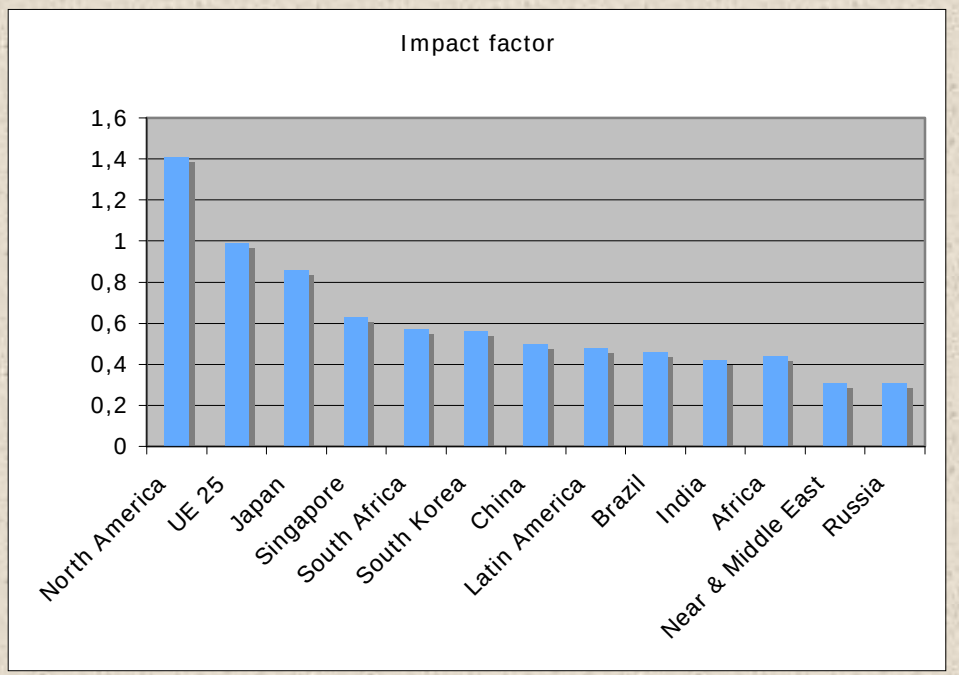
Source: Thomson scientific data (OST, 2006)

Very low scientific density / population (2003)



Source: OST, 2006

A lower international impact



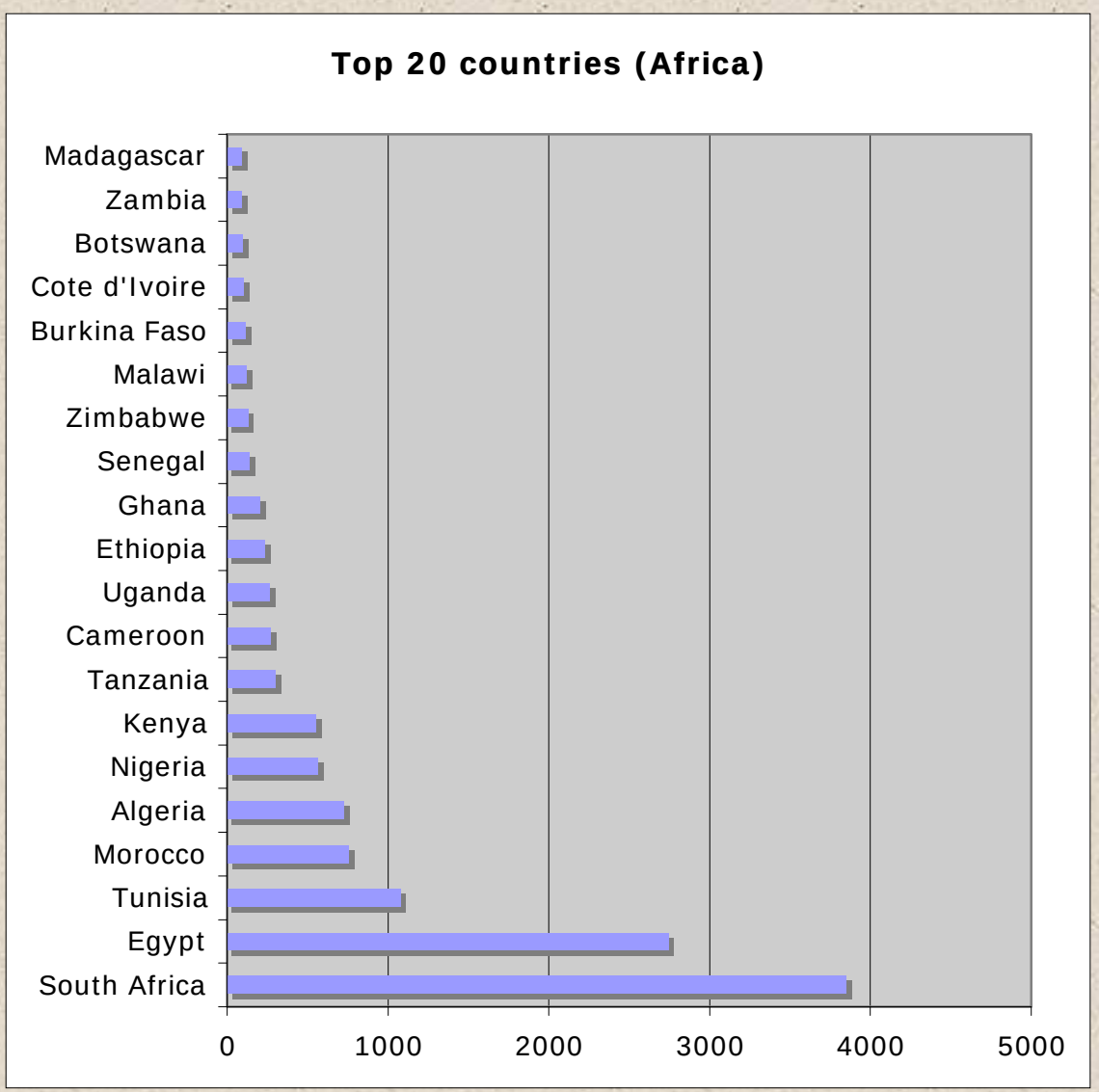
2. Science is as much concentrated in Africa as in the rest of the world

Consequences?

Science is as much concentrated in Africa as in the rest of the world (2006)

- Group 1: South Africa and Egypt (49.4%)
- Group 2: Tunisia, Morocco, Algeria, Nigeria and Kenya (27.6% - 1000-500)
- Group 3: Tanzania, Cameroon, Uganda, Ethiopia, Ghana, Senegal, Zimbabwe, Malawi, Burkina Faso, and Cote d'Ivoire (14% - 300-100 per year)
- Group 4: Botswana, Zambia, Madagascar, Gambia, Sudan, Mali, Gabon, *Benin*, Namibia, Lybia, Mozambique, RDC, Niger, Mauritius, Congo, Guinea, Rwanda, and Togo (8% - 100-25 per year)
- Group 5: 18 countries with erratic production (1%)

Top 20 publishing countries (2006)



Source: Thomson Scientific data, IRD/P.L. Rossi computing

Institutional concentration

- In the medium-size and smaller developing countries and in Africa in particular, the bulk of research activities is most often highly concentrated in one or in very few institutions.

- Extreme cases are to be found in African countries with the smallest research capacities, e.g. Swaziland with a very small and concentrated research capacity at the University of Swaziland.

Individual concentration

- In most Sub-Saharan African countries with the smallest and weakest research capacities (Groups 4 and 5 and partly 3), research outputs (publications) are centered around a few individuals.

3. Science policy in the context of scarce R&D indicators

Science policy development in the context of scarce R&D indicators

- **Three different trajectories**
- **Tendency to imitate STI policy approaches and paradigms from elsewhere (e.g. NSI concept)**
- **Large degree of similarity in the content and Emphasis in national science policy documents.**
- **Whenever available, the application of S&T policy framework is haphazard and rarely evidence-based (among others given the dearth of up to date S&T indicators)**

4.De-institutionalisation, de-professionalisation and generation gap?

Historical context

- **Different continuing colonial legacies?**
- **Weak home-based scientific potential in 1960**
- **1970-1980**
  - **intensive development of institutions**
  - **Intensive recruitment of national staff**
  - **student population explosion**
  - **steady growth in the number of scientists**

This development was supported by “aid” and the set-up of national research systems

Late 80s and 90s: globalisation, privatisation and crisis

- **Public budget cuts**
- **Mushrooming of private universities; proliferation of NGOs and strengthening of their role.**
- **Nearly no recruitment took place through the 1990s in many countries leading to ageing of scientists and the risk of a generation gap.**
- **Poor salaries in Sub-Saharan countries - staff too oftengo unpaid.**
- **Brain Drain increased leading to a further weakening of national scientific capacities.**
- **Changing nature of scientific work and profession**

National Science (1965-1985)

National Science can be defined as follows:

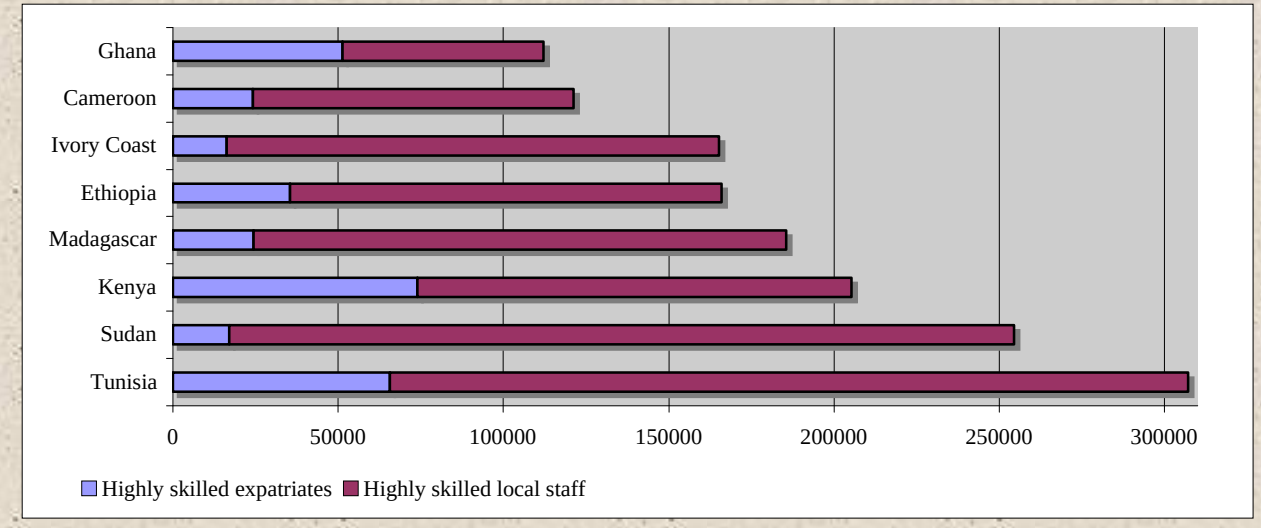
- **Science is a public good**
- **The main funding provider is the State**
- **Scientists have a nationalistic ethos**
- **Scientists are employed as civil servants**
- **Besides the peer community, the end-users consist principally of public authorities**

Changing nature of scientific work & profession: de-professionalisation?

- **The profession is increasingly practised within a contract-based and time-bound system (not in the context of a career)**
- **International (not national) demand shapes programmes and objectives**
- **Benefits and profit (rather than knowledge) define the axioms of action**
- **The system is increasingly regulated by the market, not peer assessment**

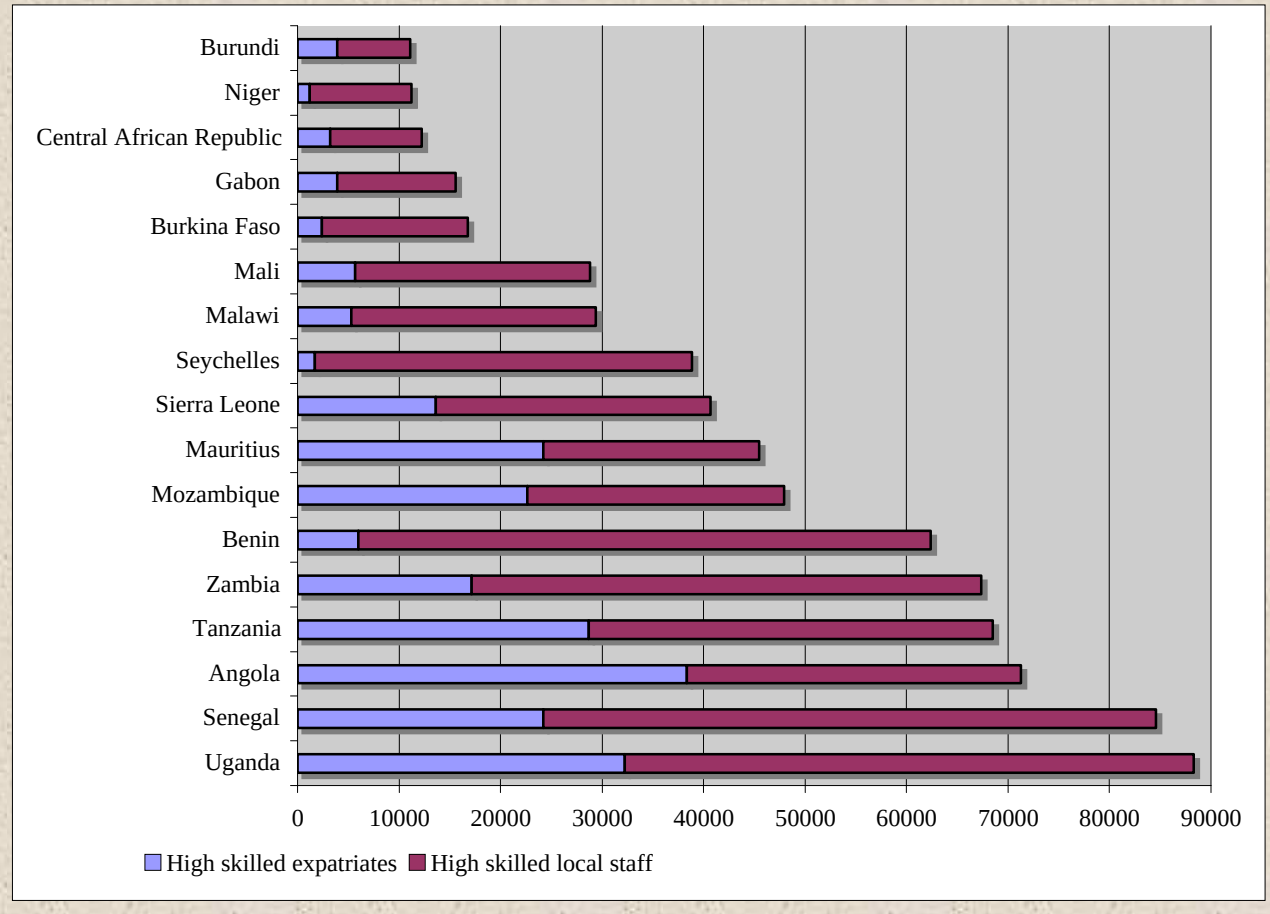
5. Brain drain and the limits of S&T Diaspora

A sizeable share of HQEs abroad (1) medium size African countries



Source: OECD, CIA & others adapted by Gaillard & Gaillard

A sizeable share of HQEs abroad (2) smaller African countries



Source: OECD, CIA & others adapted by Gaillard & Gaillard

Can S&T (diaspora) networking mitigate the brain drain?

S&T diasporas are not a magical response to science capacity building in weakest countries. While they may work in NICs (e.g. South Korea, Singapore, China), the fate of SANSA (South Africa) and Caldas (Colombia) provide evidence of difficulties. Evaluation?

Conditions to be fulfilled

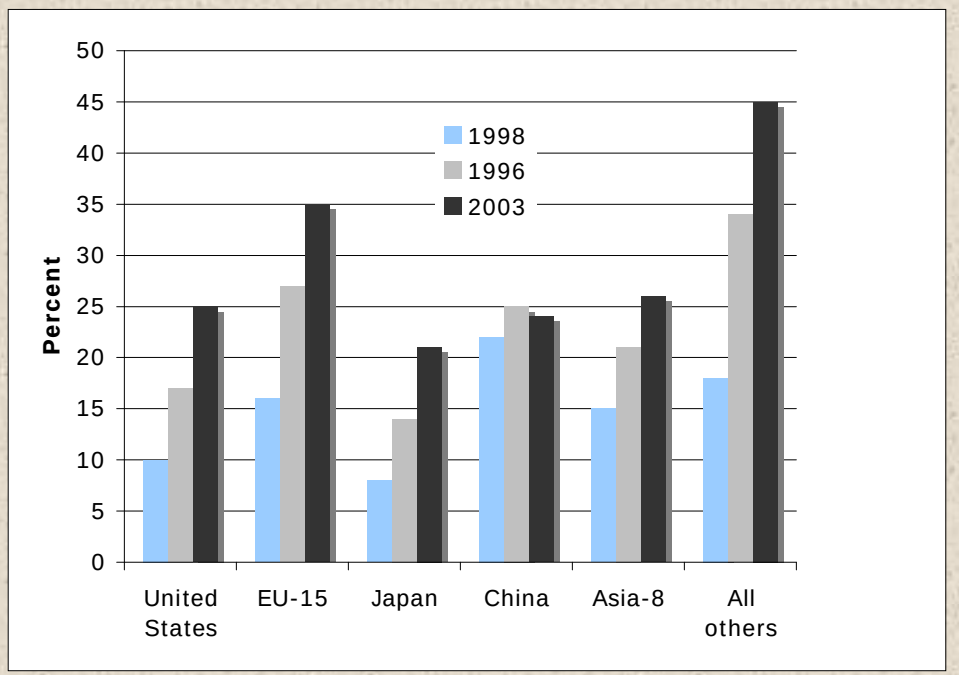
- **Long term political will**
- **Sustained will and engagement from both sides**
- **Sustained administrative capacity**
- **A dynamic and responsive scientific community with a minimum critical mass at home**

Nothing will compensate/replace home-based S&T capacities

6. International collaboration/cooperation

The limits of national science

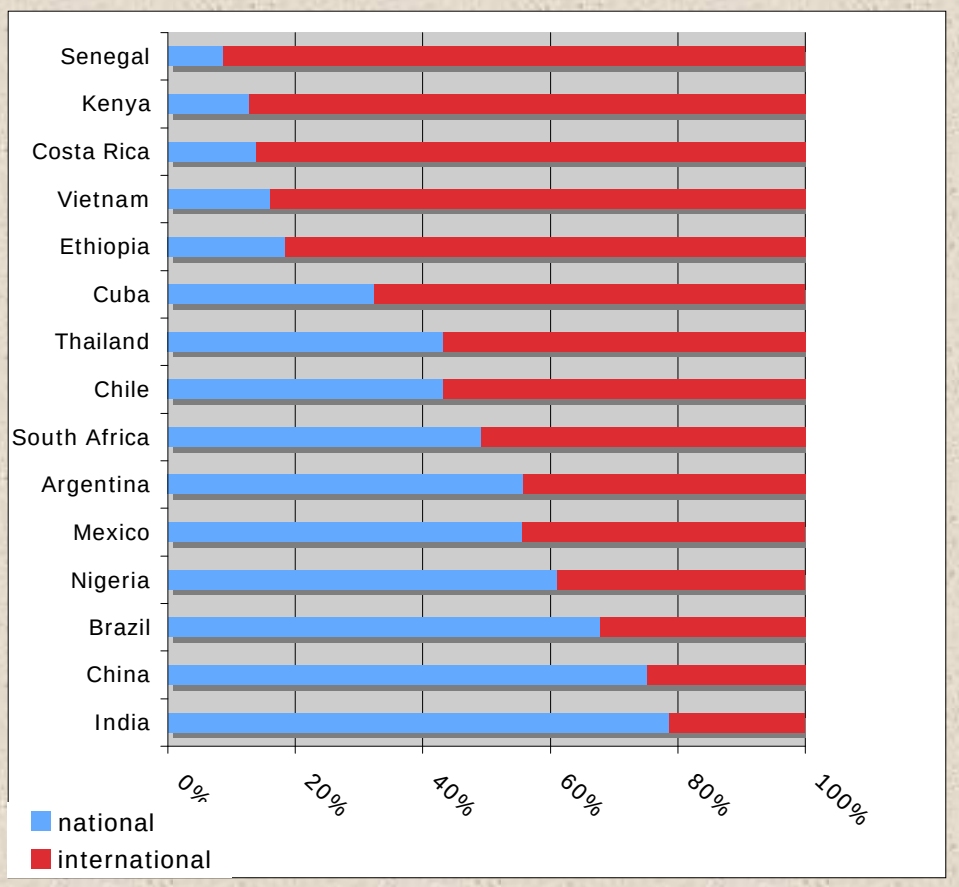
A higher level of international collaboration (coauthorship)



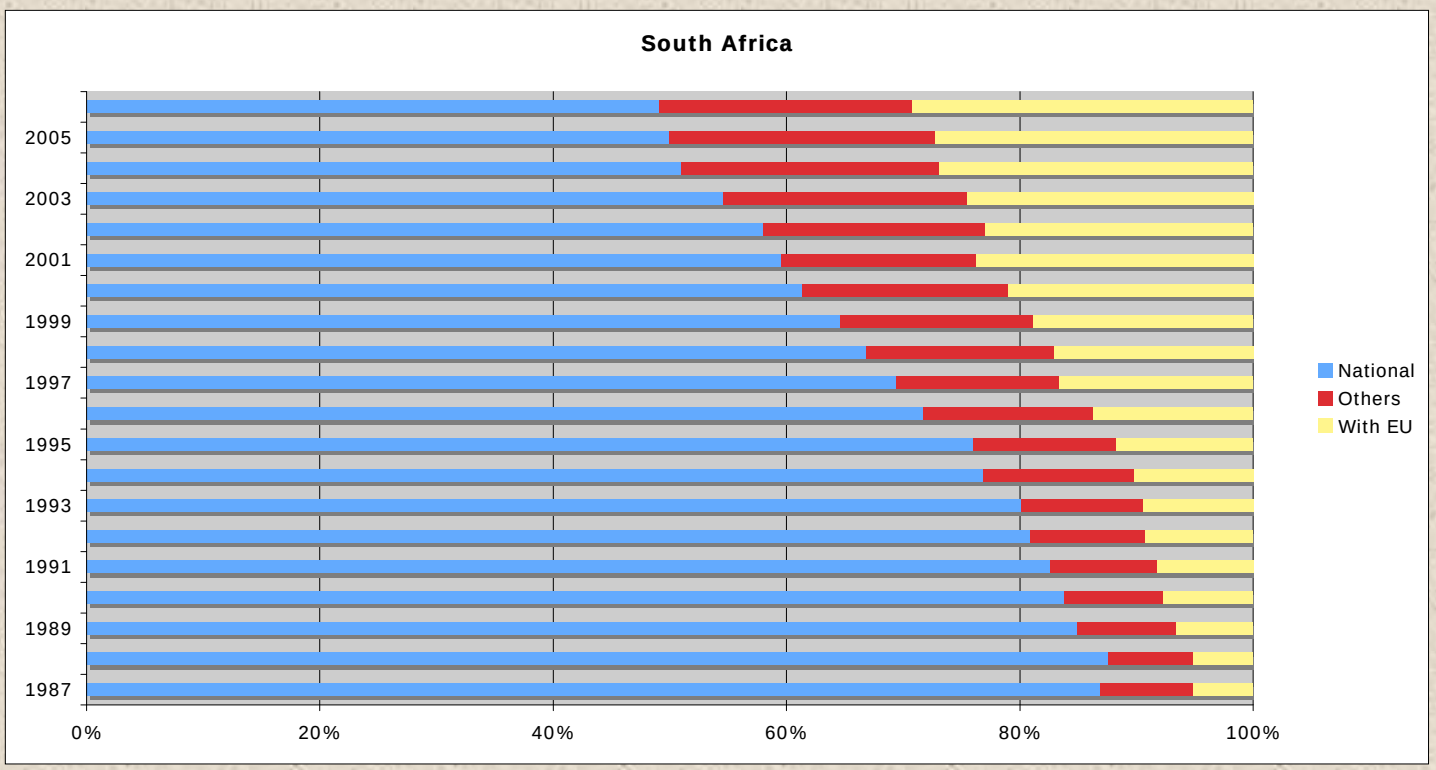
Source: OST, 2006

International collaboration (2006)

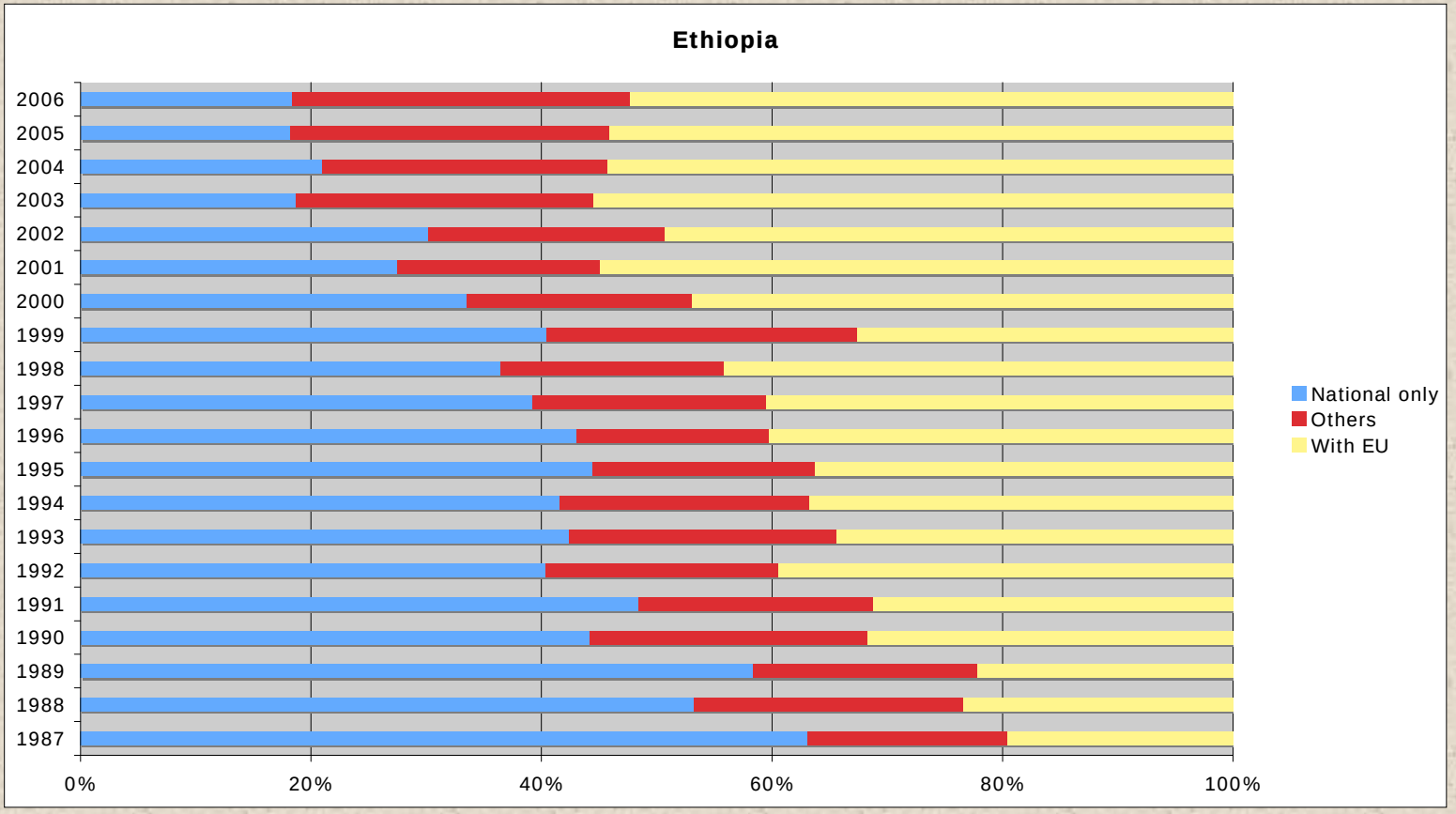
(publications co-signed with foreign authors vs. national only)



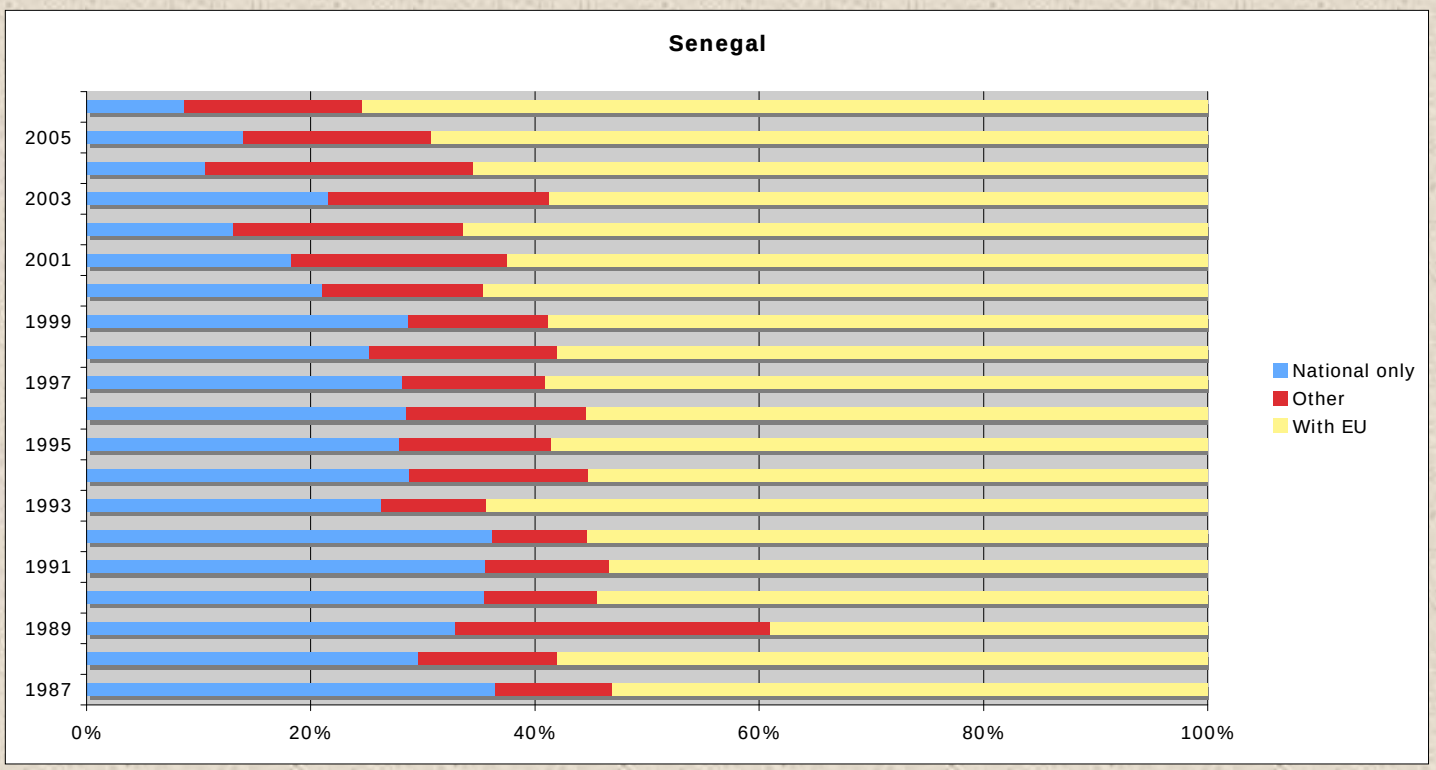
National science / International collaboration 1987-2006



National science / International collaboration 1987-2006



National science / International collaboration 1987-2006



7. Conclusion

Going beyond the meta review: the need for further studies

Conclusion

- **Available information and documentation on science in Africa is not comprehensive and up-to-date.**
- **As a first step, there is a need to fill the gaps in many African countries and ensure the regular availability of R&D indicators.**
- **Beyond macro-indicators, there is the need to collect more qualitative data and to conduct sociological surveys (e.g. on scientific communities, profession and status of scientists, social inscription of science … innovation surveys … etc).**
- **Robust R&D indicators and the results of the above surveys are needed to ensure evidence-based science policy frameworks; Strategic Evaluations; S&T Observatories.**
- **To what extent globalisation and internationalisation make the notion of national system irrelevant?**

Thanks for your attention

jacques.gaillard@ird.fr

Study on National Research Systems
A Meta-Review

Compiled by Roland Waast
Contributions by

Jacques Gaillard, Sari Hanafi, A. alHuzban, Hocine Khelfaoui, Mina Kleiche, Pénélope Larzillière.
Special thanks to R. Arvanitis and the European ESTIME Project.

The countries dealt with

- **Maghreb: Algeria, Morocco and Tunisia**
- **Machreq: Lebanon, Jordan and Syria ; Bahrain, Kuwait,**
- **Gulf: Saudi A., Oman, Qatar and United Arab Emirates.**
- **less extent Egypt and Sudan**

Feminization

- Often half of the graduates are women. This rate increase in Gulf areas

Research indicators

- **GERD as % of GDP** : between 0.1 and 03%
- Nb researchers per million of population: very little 29 Syria; 1700 in Jordan; Tunisia 1400
- SCI pubi per million of pop: Kuwait 143 and Lebanon 95

General description of the S&T systems

- Type of governance:
  - Maghreb: Centralized
  - Machreq: Grassroots
  - Gulf: commercial

HUMANRESOURCES: PROFESSION

Remuneration of Academics in Jordan

- **Number of credit hours that each staff member should teach per week:**
- Lecturer 15 credit hours
- Full Lecturer 12 credit hours
- Assistant Professor 12 credit hours
- Associate Professor 12 credit hours
- Full Professor 9 credit hours

Rate of salaries in the public universities in Jordan

- Lecturer J.D. 600-700
- Full Lecturer J.D. 800-900
- Assistant Professor J.D. 900-1000
- Associate Professor J.D. 1100-1300
- Full Professor J.D. 1400-1600

INCENTIVES TO RESEARCH
AUB

- publish or perish
- *staff member who succeeds in attracting substantial research funding can* ***"buy" part of his/her teaching time off.***
- *the University Research Board (URB)* and the Office of Grants and Contracts (OGC).
- The role of the URB is to foster and improve the AUB
- research environment.
- URB supports the AUB faculty by providing
  - Short- and long-term development grants primarily for short-term travel to conferences and workshops to presentresearch and long-term visits to research facilities
  - research grants for regular research in individual, group or collaborative research projects, and "seed grants" for newly appointed faculty members.
- *US$1,000,000.*

INCENTIVES TO RESEARCH

Structuring Research: the Tunisian Government

- **THE RESEARCH STRUCTURES**
- The policy law relative to scientific research and technological development allowed the restructuring of the national system of R&D notably through the setting-up of laboratories and units of research in the Public research establishments (PRE), Public health establishments (PHE) and the Higher Education and Research establishments.
- *The fundamental structures of research become: the laboratories and the research units.*
- The reorganization of the national system of scientific research and technological innovation allowed the setting-up of 139 research laboratories and 624 research units.

African Science and Technology Consolidated Action Plan

(Project Information)

By

- **Philippe Mawoko,**

NEPAD Office of S&T, Pretoria, South Africa

&

- **Claes Brundenius**,

Research Policy Institute, Lund University, Sweden

Contents

- The context
- NEPAD –Governance
- The Political Assertion
- R&D Flagship Programmes
- Progress
- Partnership

The Context

- Global insecurity is not only about ..., conflict, violence and ....
- It is also caused by lack of water, food, education, health, energy, clean air and sustainable source of income, cost of communications – Examples: Malaria - ebola virus – Africa Sorgum, Cassava
- Climate change is exerting additional pressure on the developing economies.

☞ Renewed thinking for science, technology and innovation for Africa's socio-economic transformation

The New Partnership for Africa's Development -Governance

- NEPAD is a **Socio-economic programme** of the African Union (AU);
- The General Assembly of the African Union;
- NEPAD **H**eads of **S**tate and **G**overnment **I**mplementation **C**ommittee (**HSGIC**);
- The NEPAD Steering Committee;
- **The NEPAD Secretariat** based in South Africa (incl.: Science and Technology, ICT, Agriculture, Education, Health etc...)

The Political Assertion (AU/ NEPAD)

- **A plan of action** that consolidates science and technology programmes of the African Union (AU) Commission and the New Partnership for Africa's Development (NEPAD);

➢ Roadmap for the improvement of scientific and technological infrastructure: Africa's Science and Technology Consolidated Plan of Action (CPA);

- CPA erected on three interrelated pillars:
  - Capacity building
  - Knowledge production
  - Technological innovation.

☞ www.nepadst.org

R&D Flagship Programmes

Cluster 1: Biodiversity, Biotechnology, and Indigenous Knowledge;

Cluster 2: Energy, Water and Desertification;

Cluster 3: Material sciences, manufacturing, Laser Technologies and Post-Harvest Technologies;

Cluster 4: ICTs and Space Sciences;

Cluster 5: Mathematical Sciences.

Progress

- R&D flagship programmes (biosciences, laser technology, mathematical sciences (AMINet), water and energy)
- Evidence-based studies (health innovation systems)
- African Science, Technology and Innovation Indicators (ASTII) Initiative
- Outreach
- *(www.africa-union.org, www.nepadst.org)*

ASTII Initiative

- Decisions of African Ministerial Council on Science and Technology (AMCOST) in 2003, 2005, 2007.
  - AMCOST 2003 endorsed the compilation of indicators for scientific research, technological development and innovation activities;
  - AMCOST 2005 called for the establishment of an African Intergovernmental Committee on African Science, Technology and Innovation Indicators

The Intergovernmental Committee Resolved:

- to define the scope of R&D indicators surveys to suit Africa's needs;
- to develop common understanding of what indicators are relevant, and why;
- to initiate both R&D and Innovation surveys in a selected number of countries.

ASTII- Activities include (2008/2009):

- Designation of national focal points
- Development and adoption of survey guidelines
- Training of national survey teams
- Pilot survey
- Evaluation of pilot phase
- Experience sharing workshop
- National surveys
- Regional workshops and synthesis
- Production of African Science and Innovation Outlook

ASTII- Partnership

- Commitment by African countries;
- NEPAD with support from the **Swedish International Development Cooperation Agency (SIDA),** is facilitating the development and implementation of the ASTII initiative; with the collaboration of the Research Policy Institute, Lund University, Sweden;
- Fostering links between NEPAD and other relevant institutions engaged in STI activities.

Thank you

UNESCO Symposium on the
Comparative Analysis of National Research Systems
Paris 16-18 January, 2008

Comparison of Assessment Methodologies for "Research" and "Research for Health Systems"

Data & Challenges

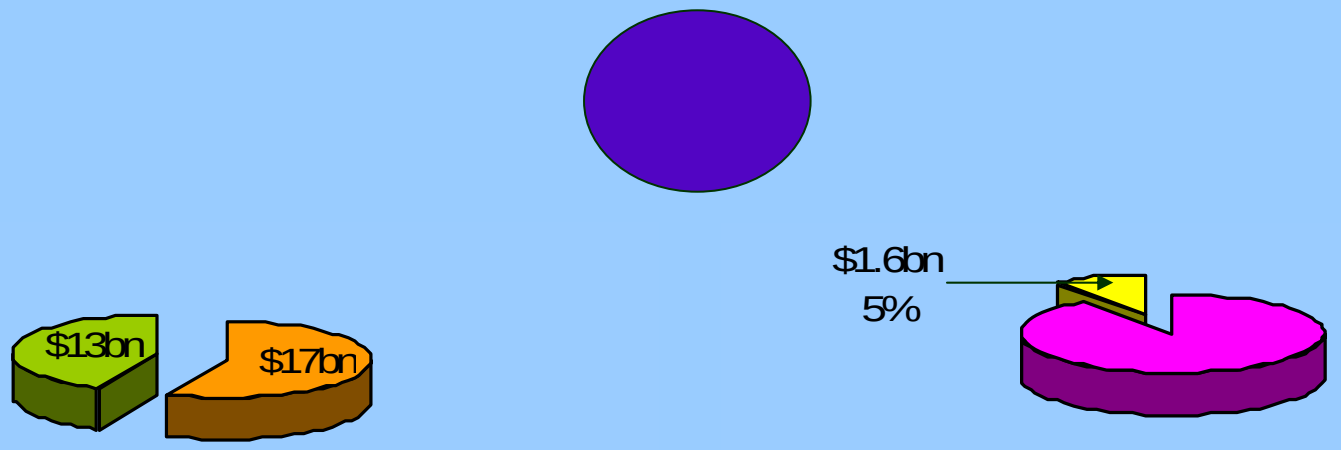
Mary Anne Burke
Health Analyst/Statistician
Global Forum for Health Research

January 18, 2008

1990 Commission on Health Research for Development

About 5% of resources for health research spent on 90% of world's health problems

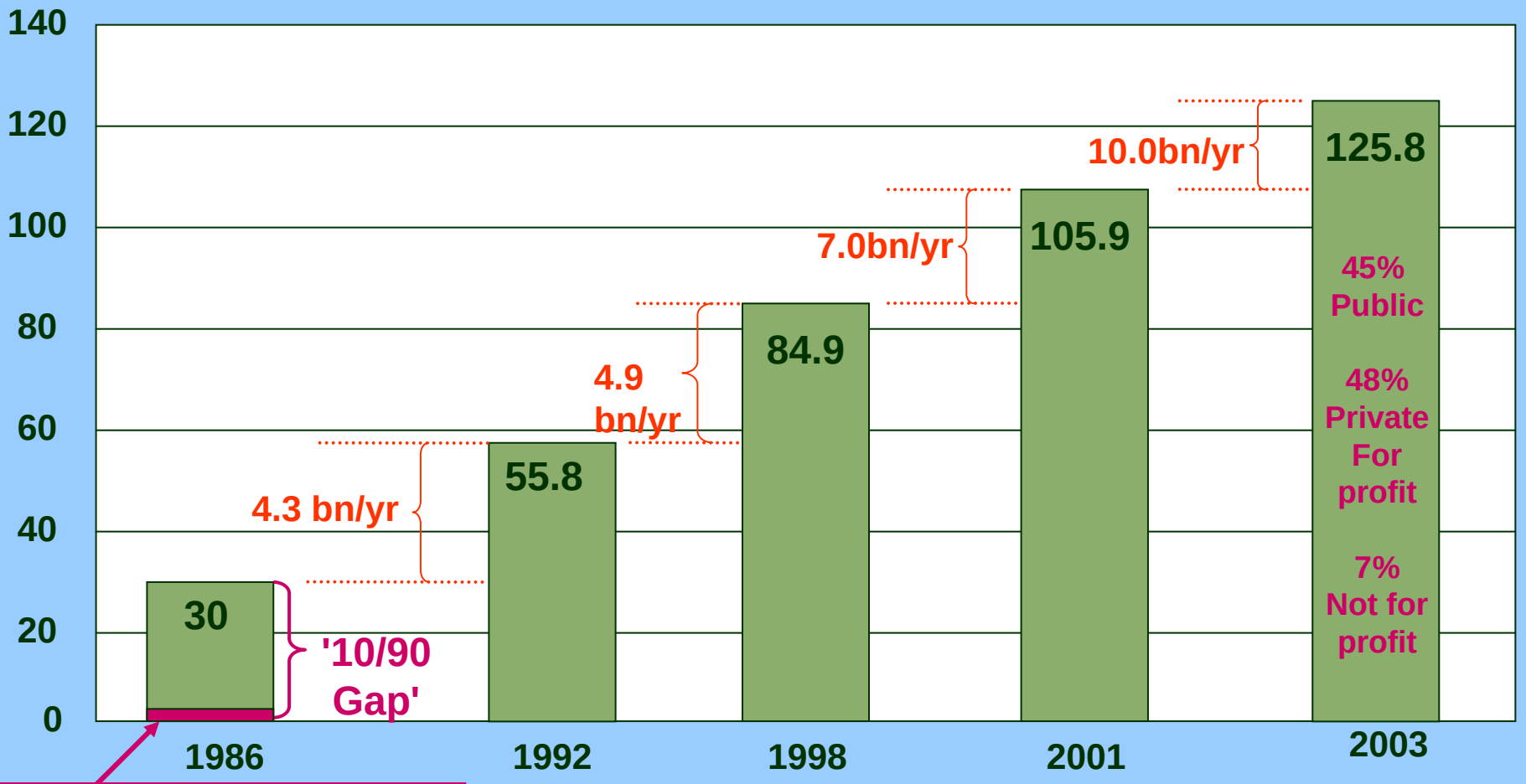
$30 bn worldwide expenditure on health research (1986)



Global Forum for Health Research

- **An independent international foundation in Switzerland since 1998**
- **Works to focus research efforts on the health of the poor**
- **Informed by principles of equity, human rights and gender equality**
- **Committed to improving health & achieving health equity**
- **Responsible for monitoring global expenditures on research for health**
- **www.globalforumhealth.org**

Global health research expenditure



US$ 1.6 bn (5%) for LMIC health needs

Monitoring Financial Flows for Health Research 2006
Global Forum for Health Research, Geneva

- Most spending done by high income countries in high income countries generating products tailored to health care markets of high income countries
- Small share funded and carried out by low and middle income countries
- Even smaller share is funded by high income countries but carried out in and for the benefit of low and middle income countries

- US $125.8 billion includes the largest known contributors
- R&D efforts of many low and middle income countries still largely unknown and unaccounted
- Measuring is far from a precise science
- Still huge gaps in our knowledge

Challenge 1

- **Build international consensus on classification system for statistics on investments in R&D for health**

Towards a standardised research for health investments classification

- Framework (HR classification)
- Initial phase with a variety of partners (1998)
- Design undertaken with WHO & COHRED (2005)
- Application/ adaptation/ testing in countries (National Governments of South Africa, Brazil, India, Mexico) (2005-2007)
- Thinking on classification continues to evolve

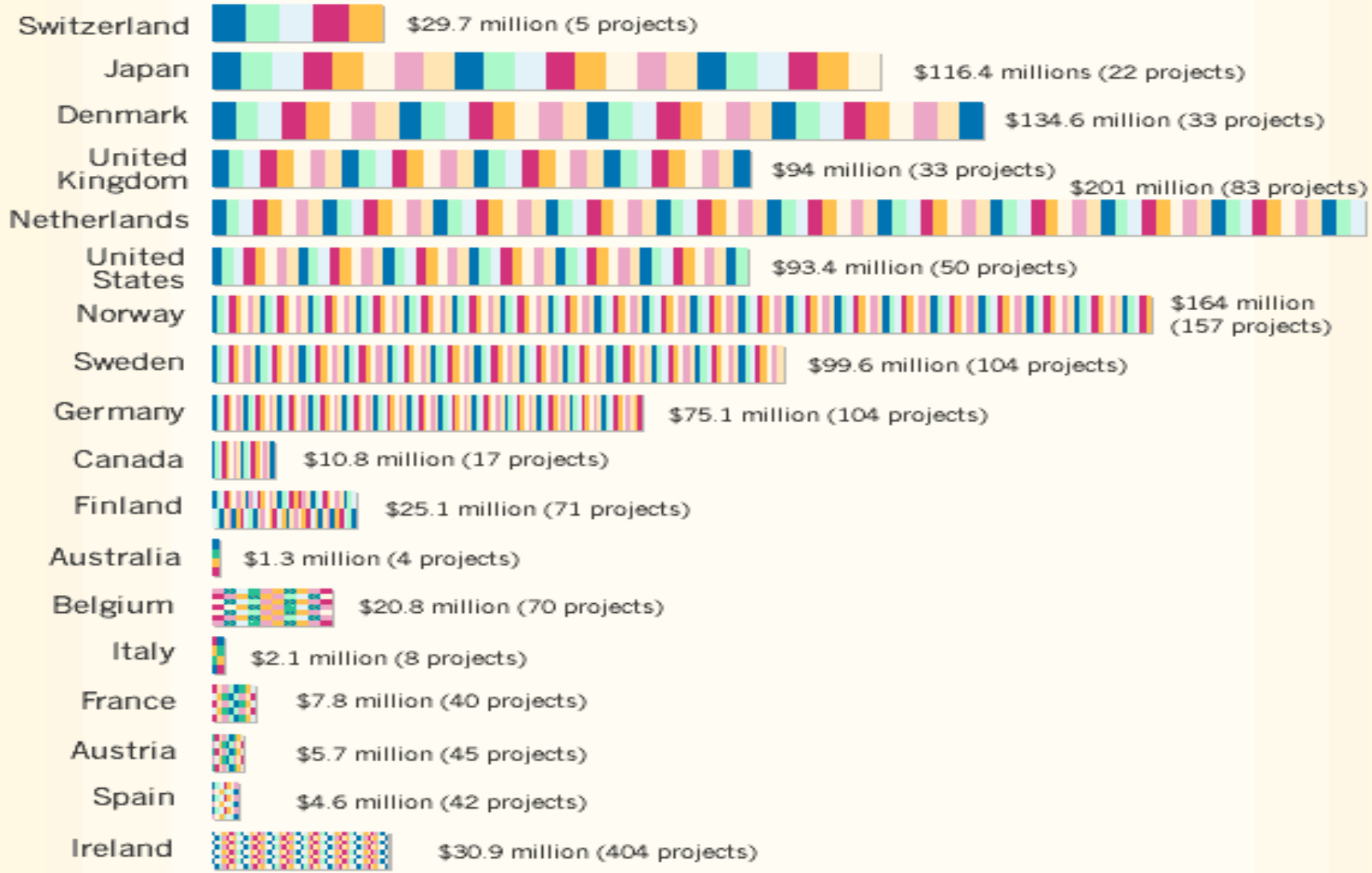
Research for Health Classification (2005)

1. Basic (fundamental)
2. Biomedical and Clinical
   - Group I (infectious/nutrition/mat-perinatal)
   - Group II (non-communicable)
   - Group III (injuries)
3. Exposures and risk factors for disease
4. Determinants of health
5. Health systems research
6. Research capacity building

Challenge 2

- Support development of sustainable systems for collection and analysis of statistics on R&D for health
  - Drawn from data across all sectors, not just health sector
  - Embedded in systems of national statistics in CSOs
  - Driven by development/policy needs of countries, not needs of donors and international community

Bilateral Donor Support to Tanzania, 2000-2002



Source: *Foreign Policy*, Ranking the Rich 2004

Current activities

- Discussions with countries on benefits
- Participation in Annual African Statistical Symposium (South Africa 2005, Rwanda 2006, Ghana 2007)
- Development of proposal with AFRISTAT to work with African CSOs to reach consensus on classification system & build capacity for collection & analysis of data
- Consensus-building on approach within international R&D/S&T/Stats communities – on-going

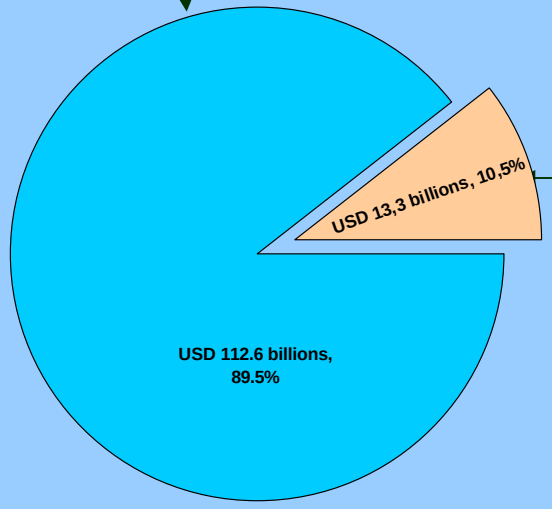
Challenge 3

- **Shift research focus from:**
  - **"Disease" to "Health"**
  - **Health sector responsibility to all of government/civil society responsibility**

through inclusive, responsive and evidenced-informed priority-setting processes

Research on "Disease-related prevention and treatment

- Basic Research funded by public and private for-profit and not-for-profit sectors
- Other research carried out by Pharma



1. Research on other "Disease-related" prevention, treatment and care:

- *Health care* policies, programmes, systems and services
- Training of health care workers
- Human resources
- Scale-up
- Disease monitoring and surveillance
- Disease prevention and treatment
  - Exposures & risk factors for ill-health and disease
  - Specific diseases or conditions
- Disease outcomes and impacts

2. Research on "Health"

- Health planning
- Public health
- Safety, quality, availability, affordability, accessibility, inclusivity of:
  - Water, Food, Housing, Sanitation
  - Natural Environments
  - Built Environments
  - Social Environments
- Health promotion
- Health education
  - Health knowledge, attitudes and practices
- Health research systems
- Health classifications systems, measures and indicators
- Health status & human functioning
- Health equity
- Social determinants of health
- Safety, quality, accessibility, affordability, inclusivity, efficiency, effectiveness, impact of :
  - Public policies, programmes, systems and services *outside the health sector*
  - *Health* policies, programmes, systems and services

Most of 2003 global expenditures on R&D for health was for "disease-related" investments, leaving little for research to create and sustain "health"

- **Our data point to continuance of global inequities in health and health research , symbolised in the expression “10/90 gap” despite growth in R&D investments**
- **Africa and South Asia continue to shoulder a disproportionate share of global mortality and morbidity**
- **Time to ask why and make shifts in focus of investments**

Challenge 4

- **Explore development of “Purchasing Power Parities” for R&D for health**

CHALLENGES:

1. Build international consensus on classification system for investments in R&D for health
2. Support development of sustainable systems for collection and analysis of statistics on R&D for health embedded in national CSOs
3. Shift research focus from “Disease” to “Health” through inclusive, evidence-informed and responsive priority-setting processes
4. Explore development of PPPs for R&D for health

Thank you!

maryanne.burke@globalforumhealth.org

National Research Systems in Asia - Report Unesco Workshop 16-18 Jan 2008, Unesco, Paris

Prof V V Krishna

CSSP/SSS/JNU

Dynamic Asia in the New Millenium

- Asia emerged as the most influential global player
- President Jacques Chirac – observed 21st Century Belongs to Asia – When French voted against complete EU integration last year
- Began with dynamic Japan during 1960s –80s
- Propelled by 'East Asian Miracle' in the 1990s
- Since 2000 – China and India holding the fort…
- Unesco Survey covered and is concerned with developing Asia

Developing Asia – Unesco Survey

Tier One	Tier Two	Tier Three
Singapore	Thailand Malaysia Philippines	Bangladesh, Sri Lanka, Nepal, Pakistan, Indonesia, Vietnam,

Developing Asia – Unesco Survey

- Very strong link between science, technology and economic growth/development in Tier 1 countries
- This link is rather quite Weak to Very Poor in tier 2 and tier 3 countries resp.
- Relative stagnation of R&D budget and growth over the decade (tier 1 exception)
- This is indicated by following S&T Indicators

Developing Asia: S&T Indicators 2000-2005

	GERD/ GDP%	S&T Pub. 2005	Researc/ Million	Patents
Tier 1 Sin/Tai	1.5 to 2.50	5400 to 14500	4745 to 2900	600 to 5400
Tier 2 Pi.Th.Ma	0.1 to 0.70	500 to 2500	150 to 400	10 to 75
Tier 3 Others	0.03 (B) to 0.24 (P)	250 to 1100 (P)	50 (B) to 450 (In)	0 to 9 -ve

STD - Landscape: Focus on Tier 2&3 Developing Asia

- Big gap between theory and practice of S&T Policy institutional framework
- Organisational structures for S&T policy created but remain isolated from other institutions
- Lack of political/state support for S&T and higher education
- Existing support to S&T & R&D is not critical
- Brain drain is a major problem in most countries
- Many countries are engulfed in political uncertainty and internal disturbances

STD landscape: HRD & HEIs

- Indonesia, Malaysia, Philippines and Thailand exhibited good progress in tertiary workers between 1990 and 2000 with 5 to 12% increase on an average for 10yrs
- 235k to 735k Indo; Mal 210 to 418k; 3.5to5.6 mil Phil; 1.0 to 3.1 mil Thai for instance.
- Similar is the case with Science and Engineering graduates
- Other Asian countries in the survey did not exhibit similar trends
- Rather there has been relative stagnation in HRD with the exception of Pakistan.

STD landscape (focus on Tier 2&3)

- Initial S&T institutionalisation has not led to creation of science communities at the national level (Malaysia exception)
- Many countries lack intellectual climate, science journals and societies
- Science communities – Universities – Specialist science groups in labs (oriented basic research) are closely linked. This is crucial for national S&T capacities
- Grass root innovations and small technologies neglected at the cost of high technology policy discourse

Country	Agricul. GDP/Lab force%	Industry GDP/Lab force%	Services GDP/Lab force%
Bang	20/63	28/11	52/26
Indon	13/43	47/18	40/38
Nepal	38/76	20/6	42/18
Pak	20/42	27/20	53/38
Philipp	14/36	31/15	54/49
Sri Lan	16/34	27/25	56/40
Thailand	11/50	44/14	45/37
Vietnam	20/57	42/37	38/6

Why Science Communities and Oriented basic research capacity essential?

- Most of the countries are still agriculture based economies with good proportion dependent on it
- Biological sciences, agriculture and health needs demands local capacities in S&T
- These capacities are linked to oriented basic research and endogenous capacities
- Tech.Transfer is costly in post-wto regimes
- Science communities – Univ – specialist groups/labs linked & have to evolve locally

Challenges - 1

- Tier 1 countries Singapore/Taiwan difficult to serve as relevant 'models' for Tier 2& 3 countries except for Malaysia and a portion of manufacturing sector
- Need a different model of S&T capacity via science communities to innovation (China/India/Singapore)
- For this - drive towards professionalisation is very important (Singapore example)
- Human resources development is essential

Challenges 2

- Strategy for SMEs and industrial cluster based innovation
- Some lessons of learning on clustering from China and India
- Transitional technologies and innovation to manage the transition from agriculture to industry/service oriented knowledge economies
- Need a new innovation perspectives for agro-industrial development

Challenges 3

- Third set of challenges relate to the impact of new technologies such as ICT, biotechnology etc
- S&T capacities here are also linked to development of universities and science communities
- Ph.D training and Professional 'sandwich' programmes with reputed universities in different countries (Singapore and Thailand good example)

Concluding Remarks - 1

- S&T policy mechanisms are grossly under developed and utilised by most countries. S.Korea, Singapore and Malaysia are good examples to emulate.
- Oriented basic research and developing science communities is not luxury but essential factor of S&T based development
- Arresting brain drain depends on the extent to which local/national science institutions promoted and intellectual climate is created
- Unfortunately there are no short cuts to this state mediated S&T based development – clear from Singapore and S Korea and other big countries like India and China
- Universities and HEIs will play a key role in future S&T based development – calls for 'neighbourhood effect of HEIs'.

Remarks 2

- East Asian 'dragon model' has very limited relevance for rest of developing Asia which are agriculture based economies
- Clustering and cluster innovation systems with regional/rural economies provide new window of opportunities
- Need public-private partnerships in technology parks, incubation and entrepreneurial schemes
- Role of industrial schools and polytechnics for skills training have a crucial role to play
- Our survey research did not focus on gender, science and technology issues. This calls for further research focus.
- Need for detailed case studies approach to identify lessons of learning from established bench marks

FORUM FOR HIGHER EDUCATION, RESEARCH AND KNOWLEDGE REGIONAL REPORT ON LATIN AMERICAN COUNTRIES

Comments

Pablo Kreimer (CONICET and UNQ, Argentina)

Latin America is a heterogeneous region regarding the development of S&T:

- **Large countries with a strong research tradition (like Mexico or Brazil), but with a very unequal distribution of income;**
- **Small but relatively equitable countries, like Costa Rica and Uruguay.**
- **More 'modern' countries, like Argentina and Chile, with a strong tradition in research;**
- **Very poor countries, like Bolivia, Panama or Paraguay with less than 8 hundred active scientists.**
- **And we have the case of Cuba.**

Human resources; a paradox:

- **scientific communities are far from being homogeneous (even though in almost all the countries, it is difficult to establish the exact number of real scientists conducting research (figures could be estimated in a range that varies from 1 to 3)**
- **there are at least two different worlds: the `scientific elites`, well integrated in international cooperation and networks, and "others" (in Mexico, for instance, the elite included in the SNI represents around 1/3 of the total).**
- **the academic degree reached by scholars is very poor: several countries have less than 10% of PhD within R&D personnel, and in 2007 in Argentina more than a half of researchers do not have a post graduate degree (Master or PhD)**

However…

- **Where do they work? (and where will they work?)**
- **"Brazil is training more than 10-12 thousand PhD per year, and 30 thousand with a Master degree. This figure is growing at a 10% per year. However, in Brazilian firms (including private, state and multinational) there are just 3 thousand PhD and Masters doing R&D. This means that the next year we could have –if the demand grows magically at 10%- a demand of around 3 hundred. But we will form around 33 thousand PhD and Master graduates in 'hard sciences'!"**

Science and technology governance:

- **Almost all the countries have a complex set of institutions, from Ministries to National Councils;**
- **Nonetheless, they still appear to be more influenced by the logic of local scientific communities than a real "State policy" oriented to an effective use of locally produced knowledge.**
- **In several countries, the set of policy institutions plays more a bureaucratic than a real role in promoting and orienting S&T.**

Evaluation systems I: researchers but not research.

- **Most countries (specially the more advanced ones) have instruments to evaluate the performance of scientists (Mexico, Argentina, Chile, Venezuela). But evaluations are more focused on "classical" indicators, like papers indexed in databases, and almost no attention is paid to the contribution made by research to attend social or economics goals**

Evaluation systems II: researchers but not science and technology policies.

- **In spite of the recent experience of Mexico, there are practically no instruments to evaluate the results of S&T policies. If one reads the accumulation of "National plans" over the time, with their ambitious goals, we might think that we are facing an ideal world, with real 'knowledge societies'**

On "meta review" report

- **3 clusters of countries or 4?**
- **The report also speaks about 3 important conditions to fully have a "modern" science and technology system:**

a) **A core relatively stable and well-resourced scientific institutes;**

b) **Consistent government and industry investment in these institutes;**

c) **Economic and political stability. Science governance allows the autonomous and independent operation of research.**

3 conditions (for “cluster 3” and 2 bis):

- **The first condition is a relative one: certainly, the institutions enjoy a growing stability compared to the past. But are they well financed if we compare them with developed countries? Are they all able to develop useful science adequate to help industry or to attend other social needs?**

3 conditions:

- **The second condition is relatively true if we are speaking about government funds oriented to 'elite' institutions, not for the entire system. However, industry investment continues to be notably scarce, with the possible partial exception of Mexico and Brazil and Chile…**

Function of research?

- **The autonomy of research community is, at the same time, a pre-condition and an obstacle to the social function of science: indeed, during the most part of XXth century –naturally, excluding frequent periods of dictatorships- the scientists have enjoyed of a large degree of freedom to choose their research subjects, they have actively participated in the establishment and development of research and science policy and institutions, they have defined their own strategies of international collaborations, and so on.**

Function of research?

- **The autonomy gave rise, in almost all countries, to a phenomenon we described as a "new international division of scientific work", where scientific elites located in most advanced (emerging) countries are producing knowledge which is used by large networks headed by 'central' groups, often related to enterprises or 'regional consortia' (European or American)**

“SNI” policies (plus-salaries to scientists)

- **The SNI policies might be evaluated. I see several questions we have to formulate: a) have they contributed to a real professionalization of the scientific communities?; b) have they strengthened the capacity of the ‘elites’, discriminating among ‘international integrated’ and ‘the others’? Have they turned more bureaucratic the strategies of scientists, prevailing activities subjects to evaluation more than other activities?**

Finally, I would like to add an other condition to those proposed:

- **"The development of a scientific and technological culture all over each local society". In other words, to break the barrier established by scientists and national states protecting S&T from any 'external' intervention. This could help to develop among different social actors the capacity to formulate demands in order to use locally produced knowledge to attend social needs.**

THE END

Reviewing national research systems: Responses, the template and country studies

Dr. Johann Mouton, CREST, Stellenbosch
Dr. Roland Waast, IRD, Paris

UNESCO Forum on Higher Education, Research and Knowledge
18 January 2008

Responses and reflections

- General comments
- What kind of report is this?
- Status of the report
- Coverage of the report

General comments

- We wish to express our appreciation for the wide range and the specific (deep and also critical) comments and proposals made
- Three categories of responses
  - Some of these comments/proposals require immediate attention (from the project team) in order to finalize and improve the quality of the report
  - Some comments require medium-term follow-up depending on the next steps
  - Some comments (however interesting and useful) do not require follow-up or action from us

What kind of report is this?

- Some of the statements made
  - Is a baseline study
  - Not enough (causal) explanations
  - Not enough evaluative and prognostic comments (good practices/ models)
  - Insufficient critical analysis
  - No policy advice or good practice proposals

A reminder: Our purpose was to produce a study -

- Which provides a mapping and stock-taking meta-review of the lesser studied research systems in poor and developing countries which could act as a reference study
- Together with some more bold ("generalizations" and analytical propositions) that emerged from the individual country studies

Status of the report

- Strengths: Wide-ranging (even mammoth and mega) and – in some cases – novel coverage of developing and poor countries' research "systems"
- Limitations
  - Unevenness of country reviews which mainly have to do with the "genesis" of these reports and availability of information
  - Data: reliability/ standardization of definitions (e.g. researchers & R&D workers/ science) & indicators
- Merle's challenge (the good enough rule): What are the minimum data (& information) quality standards required to enable making policy advice (which does not imply formulating perfect policies)

Coverage of the report

- Countries
  - Nigeria/ Egypt/Brazil/Uruguay/Central Asia
- Themes and issues
  - The nature of science/research
  - Ethics and science
  - Gender and science
  - Regional networks and co-operation
  - Use and usefulness of (social) knowledge
  - Understanding scientific communities and scientific cultures better
  - And others …..

The template

Some comments

• Templates are heuristic devices: i. e. they are frameworks (neither completely closed or open-ended) that guide data-collection, analysis and reporting
• They can be used slavishly and mechanistically OR reflexively and critically

Structured Standardized (e.g. Frascati manual)	Free format

Elements of the template
(Data or information types)

- **Research and knowledge indicators**

  [These are standard quantitative measures that allow for statistical manipulation (e.g. construction of indices) and comparison across units of analysis]
- **Descriptors**

  [These are nominal measures (not standardized) that provide basic information of quantities of units of analysis – listings of these (also chronological) allow for trend and comparative analysis]
  - Chronological descriptors (establishment of institutions, societies and journals, release of policies and plans)
  - Listing descriptors (lists of institutions, journals, societies, associations)
  - Visual descriptors (organogram of governance of science, flow of knowledge products)
- **Narratives**

  Sections of "thicker" textual descriptions and analyses that attempt to capture (historical, social, cultural) context and meaning of phenomena and are organized around themes, issues and topics

The template (1)

Category	Description	Nature of data
1. Contextualization of the science system within broader political, economic, educational and social systems	This section contains a brief narrative description of the political and socio-economic "status" or "climate" of the country highlighting significant strengths, weaknesses and major events and developments.	*Historical narrative*
	In addition a set of uniform tables listing demographic (6), social (8), economic (4) and technological indicators (8).	*Statistical indicators*
2. Some considerations about the History of science in the (country, region) under review and especially the development trajectory	Date (decade) of establishment of first research institute (s), of first public university, Scientific journals, Academy of science and/or first professional societies, Ministry for science, research and/or higher education, Science policy documents	Descriptors (listing)
	Description of specific models of scientific organization and governance as influenced by colonial and other powers historically Major periods in the institutionalization of science in country Major events shaping the development of HE and science in country	Narrative

Template (2)

3. *The governance of science in the country and available policies (especially S&T, R&D and HE)*	List of science policy, research strategy and HE documents as well as formal reviews and commissions into HE and research in the country	Descriptors (listing in chronological order)
	Research and science priorities as identified in science policy documents	Narrative
	Diagrammatic representation of science governance	Visual descriptor
4. *Knowledge and R&D performers (Establishments/ Institutions/ Universities/NGO's)*	Names of public universities, Names of private universities, Key university/college research centres, Key government funded research institutes/ centres, Key internationally funded research institutes/ centres Key private sector research facilities	Descriptor (listing)
	Description of strengths and weaknesses of the university system Niche areas of research in the system and at universities Modes of knowledge production undertaken in various sectors of the system	Narrative

Template (3)

5. Informal S&T structures (Academies, Associations, Journals) = Scientific Community)	National scientific journals Scientific societies and associations Academies of science	Descriptor (Listing)
	Status of main journals (still being published or not) (Historical) description of information structures	Narrative
*6. S&T Human Resources (Description/s Statistics + **T**he Profession of researcher: status, salaries, etc)*	Number of researchers/ scientists in country * gender Number of academics in HE institutions * gender Nr of academics by scientific field (6) * gender Nr of Graduate enrolments * field * gender Nr of M and D graduates by field of study (Natural/ Agric/ Engineering/ Health/Social/Humanities) Inbound/outbound student mobility rates Number of researchers per million of labour force	Indicators
	Profession and status of academics and knowledge workers Remuneration compared to other public professions Scientific mobility and brain drain challenges	Narrative

Template (4)

7. Research Funding (Public or private; National and international; Trends)	R&D intensity (GERD/GDP) Expenditure on R&D per researcher Expenditure by sector Source of funding (incl. overseas agencies) – actual values and proportions Expenditure by scientific field (6)	Indicators
	Role of government and other domestic agencies in funding research Role of international donor and funding agencies in funding and steering research in the country	Narrative
8. Research Output (post-graduates/ publications/ papers/ patents)	Total output in ISI-journals (by scientific field) Total output in local journals (by field) Nr of PG theses/dissertations Nr of patents Citation impact statistics	Indicators
	Description of specific policies (funding, incentive) and initiatives to encourage participation in innovation, technological learning, and research publications locally and internationally	Narrative

Template (5)

9. Scientific co-operation and agreements	Nr of bilateral scientific agreements Nr of multilateral and regional agreements Nr of international agencies operating in country Degree of scientific collaboration as measured through share of foreign co-authors of papers Nr of bilateral scientific agreements Nr of multilateral and regional agreements	Descriptors (Listing) Indicators
	Main international and regional scientific partners	Narratives
	Main institutional collaborators	
	Domains and topics of scientific research	
10. Tensions, dynamics & challenges	Social inscription of science The ethos's of science (values) Science and the state/ contract Legitimacy/ credibility/trust/ accountability Science and its publics Usefulness of science?	Narratives

Using the template

- Context (commissioned vs. self-initiated/ academic vs. governmental)
- Purpose (descriptive-analytical/ diagnostic/ monitoring/ prognostic/ policy advice)
- Resources
- Methodological considerations
  - Desktop documentary analysis (incl. “grey literature”)
  - Secondary analysis (survey/ statistical sources)
  - Bibliometric analysis
  - Primary data collection
    - Use of survey questionnaires
    - Personal interviews
    - Ethnographic studies/field observations
    - Expert panels

And what next...?

Option 1 (Essential)

- Invitation to country scholars/ experts to comment on existing materials (within specific time frame)
- Internal cleaning of report (sources/ references)
- Co-operation with UNESCO Inst of Statistics (Montreal) to check and reconcile statistical data

Product: First standard reference work in this field for developing countries?

Option 2

- Consultation with (statistical) agencies in fields such as HE, agriculture and health research on their indicator systems
- Selected country studies using the template

Option 3

- Establish and support existing and new reference centres/ observatories to undertake this work on a regional basis

Thank you

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Comment on the Meta-study

Rigas Arvanitis

IRD, France

A necessary work

- Political decision makers are not keen on supporting research
- University reform is always more important than research
- Research policy in many DCs is an outgrowth of international cooperation
- Crisis are good for research

The Meta-Study proposal 1/2

- Create the conditions for a mapping of research
  - Template
  - Bibliography
  - Network of reference centers
- Reduce the diversity to a typology of research systems.

The Meta-Study proposal *2/2*

- Support policy analysis
  - Disciplines / areas / history
- Support in-depth case studies instead of simple indicators
  - Social acceptance of science
- Field research and strategic evaluation
  - Insufficient info by stats / insufficient indicators
- Comparison is not a “panacea”
  - See pb. with the typology of countries ➔case studies

Some incomplete issues

- Not “science”, research !!!!
- Innovation + research (should we add economic specialization, foreign R&D, FDIs?)
- Confrontation with a theoretical point of view ? (see for eg. “Emic”/”Etic”, social insertion of science, knowledge in international debates...)
- What about sustainable development? Millenium objectives? Innovation systems?
- What about the special role that social sciences play in the research system ?

Some welcome additions

- A more formal exercise of the research and innovation systems (eg. Amable, Barré, Boyer)
- Create an exchange plateform / collaborative work with Unesco
  - Including bibliometric data institutions+disciplines
  - Including narratives
  - (data not comments)

Additions on the long term

- Create reference centres in some countries and create teams
    - See p.13 + examples like STEPI
- Networking of “observatories”
    - Example of RICyT
- Promote training in policy related analysis
  – On a regional basis – Unesco offices + other organizations (ALECSO, Africa, EU DG research, OECD, Globelics network)

Future strategy

- Strategic evaluation (country review)
  - Focus on uses of research
- Support micro-bibliometric analysis
  - Support specific surveys

Strategic Evaluation

- not only expert rounds

- Deskwork (indicators)
- Analysis of survey results
- Experts foreign/local by domain
- Field work (case studies)

Uses of research

- Focus on uses of research and innovation through research (R&D)
  - "productive knowledge"
  - areas that are interface

Bibliometrics

- Support micro-bibliometric analysis at the level of disciplines and institutions → create a specific training on these issues (see example country/discipline)
- Eventually create specific databases ?

Future surveys

- Surveys on innovation: SMEs and technological learning
- Surveys on cooperation + labs : A real need that has not been covered
- Pay attention to the accumulation of narratives (case studies/local knowledge)

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OECD country reviews of national innovation system- An introduction

Gang ZHANG
Principal Administrator,
OECD Directorate for Science, Technology and Industry

Presentation at the UNESCO Symposium on Comparative Analysis of National Research Systems

Outline

- OECD country reviews of NIS:
  - Background of the new innovation reviews
  - Features, objective and focus of the new reviews
  - Scope and Process
  - Impact
- Insights from OECD China innovation review: a special full-fledged county review
  - Background and rationale
  - Objectives and design
  - Implementation
  - Roadmap
  - Experience learned

OECD Country S&T reviews

Historical background of OECD S&T reviews

- Reviews of *S&T policy* were carried out since early 1960s, until mid-1990s, concentrating in two periods:
  - 1963 - 1974 (19 reviews)
  - 1981 - 1996 (19 reviews)

- 1996-mid-2000: no reviews; a shift of focus on
  - NIS approach as an organising framework for new reviews;
  - thematic reviews to explore specific aspects of S&T policies more in-depth, and for comparisons among smaller groups of countries.

A new wave of country linnovation reviews since mid-2000s

- Since 2005, a renewed interest in NIS reviews;
- Completed: Luxembourg, Switzerland, New Zealand, Chile, South Africa, and China;
- Ongoing I: Norway, Korea and Mexico;
- Ongoing II: Hungary, Greece, Turkey;
- Reviews requested for 2008-9: Russia, and a number others under discussion, etc.

Factors behind the renewed interest in innovation policy reviews

- Knowledge economy: Innovation a driver for growth, and Innovation policy has moved up on the policy agenda, and has become closer to the core of economic policy making;
- Globalisation: Many countries perceive a need of making their innovation policy more effective, not least to better respond to the challenges and opportunities of globalisation;
- NIS framework approach: Recently there has been renewed interest in *overall* assessments of innovation policy, based on an innovation systems framework
- Competitiveness concern: There is a strong interest in the relation between innovation policy and innovation performance and economic performance/competitiveness
- Broad interest: The interest for an OECD review is shared by countries of different levels of economic development and innovation performance, both Members and non-Members of the OECD, reflecting an interest in int'l benchmarking and learning.

Features of new NIS reviews

- Carried out under the auspices of the OECD's Committee for Scientific and Technological Policy (CSTP) –benefits from many thematic work of the Committee/ and the review, which mutually reinforce each other
- Scope: S&T and innovation
- Voluntary: self-funded
- Timing of the reviews is often chosen according to the client country's political and strategic policy needs
- An individualized service: Reviews are tuned to specific needs of countries and to address country specific priority issues, etc., through more tailor-made design (scoping and formulation of Terms of Reference)
- Strong orientation towards concrete recommendations across a spectrum of innovation-related policies
- Meanwhile it keeps a common core in terms of approach and cross-cutting issues (such as the impact of globalisation, and systematic efficiency etc.)
- Collective learning process: Coverage of OECD Members and Non-members, contributing to a mixed portfolio of countries, and expertise

Objectives and focus of the new OECD innovation review

- It does not attempt to address all issues which might arise in building a stronger innovation system, but rather concentrates on those concerning the contribution of the public research organisations, including its interaction with business, and public policies
- It focuses on the governance of public research …
- It builds on recent OECD work, especially on the links between innovation and economic performance, and on best practice policies to foster innovation
- It formulates a set of policy recommendations, but does not attempt at detailed policy design
- The deliverable comprises two parts: A short overall assessment with policy recommendations, and a background report

Scope of the reviews: Mandatory Items

- ✓ *Mandatory items*:
  - ✓ Innovation and economic performance;
  - ✓ International benchmarking of innovation performance;
  - ✓ Framework conditions for innovation;
  - ✓ Governance of the innovation system;
  - ✓ Promotion of business R&D and innovation;
  - ✓ Industry-science relationships,
  - ✓ Human resources for science and technology (HRST);
  - ✓ Knowledge infrastructures;
  - ✓ Internationalisation of R&D;
  - ✓ Evaluation.

Scope of the reviews: Special emphasis

- ✓ Special emphasis *depending on the country being reviewed*, e. g.
  - ✓ The role of higher education,
  - ✓ Entrepreneurship and SMEs;
  - ✓ Sectoral innovation issues and case studies (including services);
  - ✓ The regional dimension
  - ✓ and specific policy instruments e.g. the role of innovative clusters, etc.

Process

- Joint drafting of Terms of Reference (ToR) signed between the OECD and an agency of the reviewed country (which coordinates with other stakeholders)
- Preparation of Background Report by the reviewed country, based on specifications provided by the OECD, which can be used as a template for self-review.
- Forming of a review team: OECD Secretariat, consultant(s), in the case of complex arrangement (e.g. China) co-ordinator
- A Fact-finding Mission (normally one week) to interview the major stakeholders in the national innovation system
- The OECD Secretariat prepares a (150-pages) draft final report containing assessments and recommendations which serves as a basis for a peer-review meeting within the OECD
- Comments by reviewed country on the draft report:
- Peer review meeting held in the OECD
- Presentation at a national conference of findings and recommendations of the country review, typically involving high-level decision makers, stakeholders and media in the country being reviewed
- Publication of the Review under the responsibility of the SG of the OECD

An illustration: the case of Luxembourg

- Concern over the risk of erosion of current comparative advantages (in banking and legal services) under knowledge economy, and EU integration and globalisation
- Invested resource in past years to establish a public research infrastructure (government labs and, recently, the University of Luxembourg)
- Need for strategic direction for investing into future comparative advantage (innovation)
- Ready to implement OECD recommendations

IMPACT: Luxembourg

- 9 May 2006: The main findings of the Review were presented to and discussed with ***key stakeholders*** at a working meeting, hosted by the **Minister of Culture, Higher Education and Research and the Minister of Economic Affairs and Foreign Trade.**
- 22 May 2006: the main recommendations of the Review were presented to the ***Parliamentary Commission*** for Culture, Higher Education and Research of the Luxembourg Chamber of Deputies (Chambre des Députés).
- 31 May 2006: The Draft Final Report was presented to the ***public in Luxembourg at a high-level event*** with the participation of the Minister of Culture, Higher Education and Research, the Minister of Economic Affairs and Foreign Trade, and the State Secretary for Culture, Higher Education and Research.
- June 2006: the ***Luxembourg Chamber of Deputies had in-depth discussions*** of the findings of the Review,
- Since then: Major recommendations (improving stirring/funding mechanism for PRIs, moving to performance contracts, creation of high-level advisory board for S&T policy, etc.) of the Review are already put in the process of implementation

The outlook of the review

- Continuing strong demand for Innovation Policy Reviews
- Growing portfolio of countries examined;
- Different clusters of countries, different in terms of needs and policy agendas
- Identification of “good practices”, feedback to thematically oriented OECD work, and collective policy learning

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OECD China innovation review:

a special full-fledged review

Background and Rationale

- China is Observer in CSTP since 2001:
  - Readiness for the review
  - a search for a sustainable growth model
- China is an increasingly important player in global R&D
- Chinese government embarked in an ambitious strategy for building an innovative nation (2006-2020)
- China wishes to learn from OECD experience in promoting science and innovation
- OECD countries need to better understand Chinese innovation system and policy and its potential

Objectives of the Review

- An in-depth and comprehensive review of the Chinese National Innovation System
- Recommend policies and fine-tuning of existing policies for improving the Chinese NIS performance and for facilitating a smooth integration of the China into the global innovation system
- Facilitate China's learning from the OECD countries' experiences
- Improve the OECD expertise on China's NIS
- Strengthen policy dialogue between China and OECD countries, notably on issues of mutual interest and impact (e. g. international mobility of Chinese researchers and the globalisation of R&D, etc.)
- In sum: *Mutual interest, benefit and two-way learning*

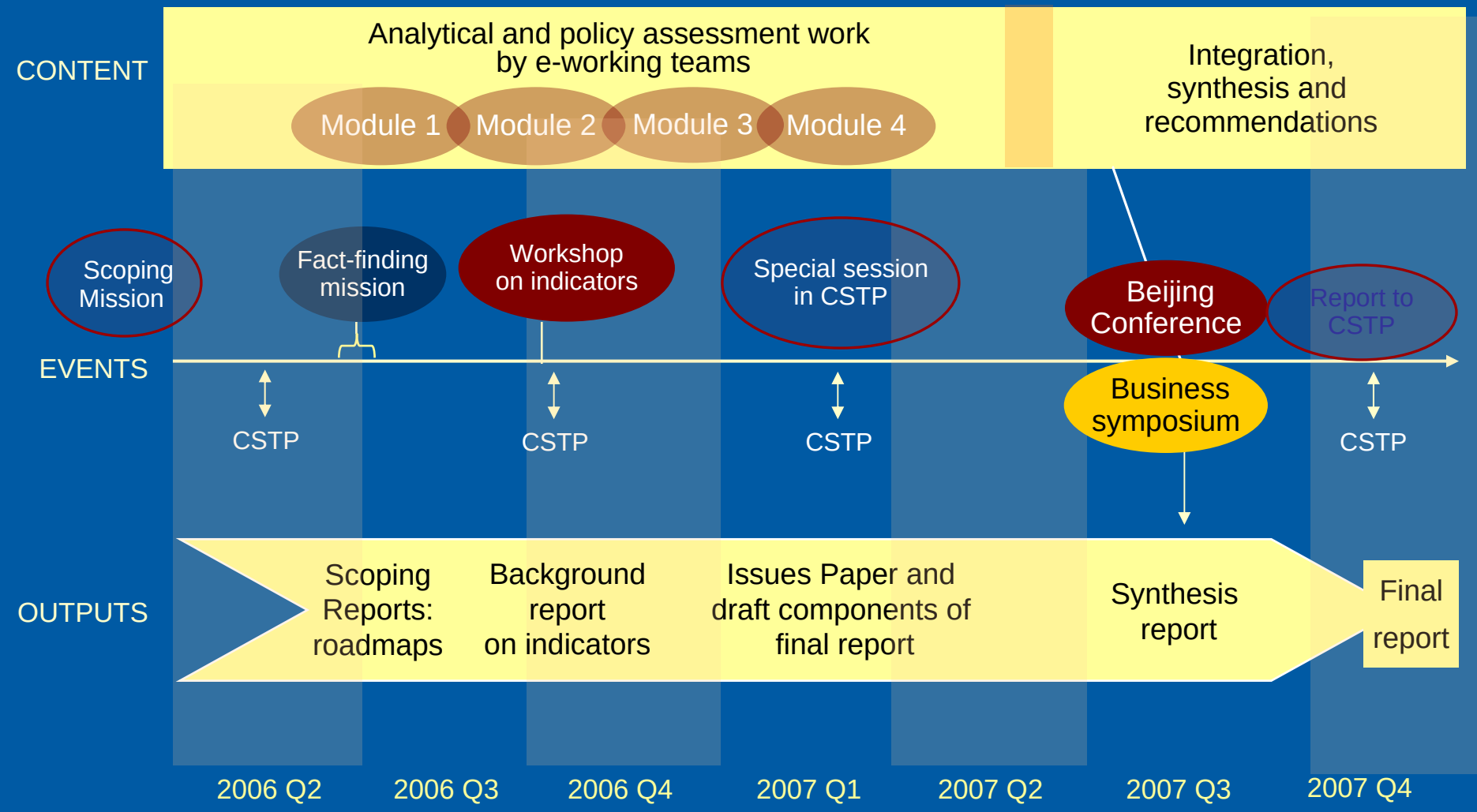
The focus and design of the Review

- Four interrelated yet standalone modules:
  - An international comparison of innovation *indicators* in China and selected OECD countries
  - Policy and institutional analysis of Chinese NIS.
    - Case studies of regional innovation systems
  - Globalisation of R&D and implications for Chinese NIS.
  - Supply, demand and mobility of Chinese human resources for science and technology.

Review implementation

- A joint project between OECD and Ministry of Science and Technology, China
- 2 years for implementation
- Experts from OECD member countries (Australia**,** Austria, Finland, France, Germany, Japan, Korea, Norway, Sweden, United States, etc), participate
- Chinese MOST funded local costs and provided experts to work with the OECD review team

PROJECT ROADMAP



Some experience learned

- The quality of the background paper is important to the quality of the review.
- Participative approach throughout the process is important: officials responsible for S&T policy should find time to participate in the review meetings and interviews;
- Scoping is important to help identify priority issues: a review cannot address all problems.
- Benchmarking is the means, and problem solving is the end;
- Policy recommendations are what the review can add most value;
- Due attention given to indicators and statistics - infrastructure for informed decision making, this is particularly, but not exclusively, important to developing countries.
- Field mission should reach all stakeholders at appropriate levels (policy making and implementation)
- Capacity building through participation at appropriate levels is key to maximize the learning effect: policy makers, government, researchers;
- Capacity building seminars can be a valuable side-product.
- Dissemination should be planned carefully from the outset of the project (translation of the report into national language).
- Communication of review results should aim at the highest possible level of decision-making, media and general public as well.

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Thank you for your attention!

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Download the review reports at: www.oecd.org/sti/innovation/reviews