Strengthening Science and Technology in the Developing World

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Summary Outline

1. Development challenges

- The gap between rich and poor countries is widening, not closing.
- The problems facing the developing world are well known:
  - incidence of infectious diseases, especially HIV/AIDS
  - protectionist trade policies
  - the digital divide
- · Addressing the gap is an issue of security, as well as morality and fairness

2. Need to strengthen S&T

- The world is changing at a rapid pace, driven by
  - Accumulation of scientific knowledge and technological applications
  - Ever more powerful computers and lightning-fast communications.
- Innovations: often fail to benefit those who need them most; benefits not shared equitably.
- International community: inadequate attention to the needs of capacity-building in science and technology
  - the engine that drives knowledge-based development.
- Correcting that omission:
  - infrastructure
  - investment
  - institutional / regulatory framework
  - personnel to conduct scientific research and technological development
  - *Inventing a Better Future: A Strategy for Building Worldwide Capacities in Science and Technology*, The InterAcademy Council, 2003

3. Consequences of weak S&T

- Growing gap between "have" and "have-not" nations.
  - Vicious cycle: developing countries (especially the S&T-lagging countries) fall farther behind the industrialized nations
  - They fail to apply scientific advances and new technologies creatively
  - Current disparity likely to grow

4. Role of S&T in Development

- The role of science and technology in development: Many excellent policy studies, but seldom have led to implementation.
- A number of focused initiatives, some of which are quite successful.
- The development community agrees that S&T is an essential component of development, but requires the right context:
- good governance,
    - reasonably stable economic circumstances with continuity between governments,
    - the right balance between bottom up and top down,
    - building on lessons learned.

5. S&T as a system

- S&T is a system involving:
    - science education
    - integration of research and training
    - science and engineering to address issues of local and regional importance.
- S&T is cross-sectoral.
    - Diverse ministries – commerce, environment, health, agriculture, education – have an S&T component.
    - In government, S&T occupies a different role than traditional line ministries.

6. Why should developing countries and banks invest in S&T?

- Investing in science is a global issue, especially in developing countries.
- Why invest in S&T instead of more immediate concerns?
    - Ben Mgubane, South African Minister of S&T: funding only immediate priorities without funding basic science = giving someone a fish instead of a fishing pole.
- Aid: A history of S&T development, focused mainly on agriculture, public health, infrastructure. By and large, has not built capacity.
- William Easterly, former WB economist:
    - Since World War II, donors have spent nearly $1 trillion fighting poverty
    - No dominant aid strategies have worked consistently: capital investments, population control, adjustment lending, debt forgiveness, educational investments,.
    - Only factor consistently associated with economic progress = technical progress
        - determined by noneconomic causes such as basic science (first proposed by Solow in 1957)
    - Evenson's 2x2 matrix.

7. Challenges to strengthening S&T

- Excellent studies have described challenges to S&T capacity building and innovation:
    - Limited S&T capacity (institutional and human)
    - Lack of financial resources
    - Non-competitive private sectors in developing countries
    - Lack of political will, stable policies, law enforcement
    - Short-term needs override long-term investment in S&T
    - Need better data to document linkage between building S&T capacity and development, especially economic growth. Applied areas (agriculture, public health) better documented.

8. S&T policy studies

- Recent studies refer to need to build capacity in S&T.
    - Carnegie Commission on Science, Technology, and Government, a decade ago – well over a dozen studies; prescient; superb recommendations. World Bank and other; few acted on.
- UNESCO's World Conference of Science in Budapest:
    - *"Promoting fundamental and problem-oriented research is essential for achieving endogenous development and progress... Today, more than ever, science and its applications are indispensable for development."*
- RAND Corporation: "S&T are Critical to Economic Growth"
    - *Conclusion: "Many development experts and policymakers increasingly see investment in science and technology as a key contributor to economic growth and the development of a market-based economy."*
- IAC Report
    - Lack of implementation. IAC report, "A Strategy for Building Worldwide Capacities in Science and Technology," to be released soon.
        - Resounding call to action – to implement policies described so well.

9. A propitious time

- Renewed interest in S&T as essential component in development
- NAS seminar: Jim Wolfensohn's talk; major foundations; IDB meeting previous week
- Increased sense that scientific community recognizes this is important issue.
    - Scientists are learning they must participate more actively and publicly.
    - They need to learn from and work with professionals in development in order to strengthen S&T and its uses; build human resources; bring S&T into the development portfolio of nations.
- Capacity building in S&T can learn from capacity building efforts in other areas - both failures ad successes.

10. Bottom-up strategies

- NAS seminar
  - Overarching, top-down strategies not generally successful
  - Need policy framework
  - Most of case studies small, focused efforts, like MSI.
- Building S&T capacity in developing countries cannot be pushed by donor countries.
  - Scandinavians learned long ago; Americans learning it; Bank has always known it.
  - There needs to be pull from the developing countries and partnership with them.
  - Again, MSI was cited as example of this pull.
- Bottom-up strategies at TWAS
  - Programs, small grants for scientists, excellent, especially scientists in least developed countries.
  - Mohamed Hassan proposed so eloquently as centerpiece of his Sigma Xi presentation: this can be done through regional programs:

11. Examples

- IMPA (National Institute of Pure and Applied Mathematics), Rio de Janeiro: Focus for research and training throughout Latin America; now an MSI Institute.
  - Of 39 Visiting Professors in 2003, 32 came from outside Brazil.
- Patagonian ice fields program
  - "Regional-plus": Chile, Argentina, Denmark
  - Effects of global climate change on local biological communities over centuries
- Biotech in Africa (of MSI)
  - A regional collaboration: Uganda, Cameroon, Botswana, Namibia
  - Combines "basic" and "applied" research and training; health care and agriculture
- Regional consortia
  - E.g., East African Community (Uganda, Kenya, Tanzania). Development Strategy, 2001-2005:
    - "Partner States recognize the fundamental importance of science and technology in economic development…. S&T policy aims at putting in place policy measures that will enable creation of a science-based culture, and to ensure diffusion and utilization of results of R&D."

12. What does the scientific community need to do?

As they become more explicitly engaged in capacity building, there is much the scientific community can do:

- Reach out to the development community
- Measure and publicize the impact of investment in S&T
- Continue to document the return on investment in S&T
- Encourage governments to make significant investments in S&T, especially of demand driven S&T
- Press governments to support systems that transfer results of research to society
- Engage the private sector in R&D

13. Many people and small groups are "doing"

Most significant implementation comes from individuals and small groups.

- NAS seminar:
  - SciDevNet, started by former editor of Nature.
  - Guy silvijello?, Virtual Institute of Materials Science from this country; Africa, now including LA
  - Carol Priestley, heads small but effective effort to provide access to scientific resources to scientists in developing nations (INASP, International Network for the Availability of Scientific Publications)

14. MSI

A program of "policy by doing" that incorporates many lessons learned.

- Objective
  - Building capacity for modern science and technology and its uses
  - Focus on pilot programs projects planned and implemented by local scientific leadership.
- Chronology
  - Origination with James Wolfensohn/World Bank, international scientific communities, governments
  - Santiago convocation
  - First initiative in Chile
  - Now being implemented in Africa
  - Early discussions in Vietnam
- Characteristics of MSI programs
  - Operations are lean & agile
  - Located within existing institutions
  - Flexible decision-making
  - Builds links to the productive sector
  - Often regional, with loci of scientific centers forming a virtual institute
- MSI is one instrument to address building of S&T capacity, with support of Bank; it touches on almost all aspects of the S&T system.

- Creates models to build S&T capacity by addressing S&T policies discussed above.

15. Four essential steps:

(1) Involvement of scientific community

- Large S&T development projects fall short of desired impact, often because did not bring scientific community into design and implementation. Implemented by development people and ministers without active involvement of scientific community.

(2) Scientists must learn from development professionals. Scientists need to

- make their own contributions in S&T
- make good connections with development community
- be willing to learn from development professionals

(3) S&T must be integrated into budget

- Local scientific leaders and development people work with the government ministries, convince them that S&T needs to be integrated into the budget for the development of the country.
- Work with economists in major development agencies, such as the World Bank, or in the Ministries of Treasury or Finance in the developing country
- Scientific community has to learn to work more effectively with ministries.
- Present a stronger case for S&T as a priority component of development in the budget.

(4) Hard work on the ground

- This vision will require a lot of hard work "on the ground."
- Volunteerism seen in the US, serving on NRC committees, etc.
- Not yet a tradition in many developing countries. This same kind of spirit will be necessary.
- Talk later this afternoon about GSC, a new model.

16. Conclusion

- The policy studies have been done, we know what to do.
- It is possible to translate policy into action.
- Most successful models are small and even individual efforts in partnership with local scientific leadership and effective communication with the relevant government ministries. Now we face the challenging and rewarding task of following their example.