

The evolving science and technology landscape and the models and opportunities for science diplomacy

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Guiding Questions

- National leadership:
 - What leadership is shown by the public and private sectors to harness S&T for national goals / societal well-being?
 - What is the role of science diplomacy in advancing domestic or foreign policy goals?
- International partners:
 - Who is involved and what science diplomacy models are in demand?

CSPC 2013, Toronto, November 21-22 2013

Panel: The evolving science and technology landscape for development in the South and the models and opportunities for science diplomacy

“STI policy advisory bodies and science diplomacy: new kids on the block?”

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Content

1. Some thoughts on science diplomacy
 - Differences in **rationales, actors and instruments** between the developed world and developing countries, especially Latin-America
2. STI policy advisory bodies and science diplomacy: a new actor?
3. Cooperation among S&T agencies in Latin-America: a consultation workshop

1. SD in the developed world

Rationales

Security affairs and conflict resolution: heritage of WWII

International development: new green revolution; climate change; sustainable development paradigm

Competitiveness based on STI products: global marketing efforts

Soft power: influence for attracting sympathy, talents, capital and political support

Actors

Ministries: Foreign Affairs (FA), Education, Science and Technology, Industry and Competitiveness

Governmental STI agencies/centers (NRC, NSF, DFG, JST, S&T Office White House; CNRS)

Scientific associations and societies (AAAS, Max Planck, JSPS)

Development agencies (USAID, GIZ, DFID, IDRC)

Multilateral agencies

Instruments

High level (presidential) international visits

S&T collaborative programs and agreements

Agenda-setting in international organizations

Cultural and scholarship programs

Recently: knowledge networks with governmental support

Conflicts

Overlapping of governmental agencies: coordination problems

Scientific vs. Political rationales

Cooperation vs. Competition

SD in Latin-America*

Rationales

Looking for the former S&T regional funds (OAS, Alliance for Progress)

International cooperation will strengthen the local innovations systems: funding + legitimation

Economic competitiveness

Promotion of South-South cooperation

Actors

Ministries: Foreign Affairs; Education, Science and Technology; Industry and Competitiveness

Multilateral agencies

Instruments

Diplomatic bilateral commissions

S&T collaborative programs and agreements

Cultural and scholarship programs

Scientific diaspora networks

Regional funds for the promotion of S&T (occasional)

Cooperation agendas within Free Trade Agreements

Conflicts

Overlapping MFA and scientific agencies

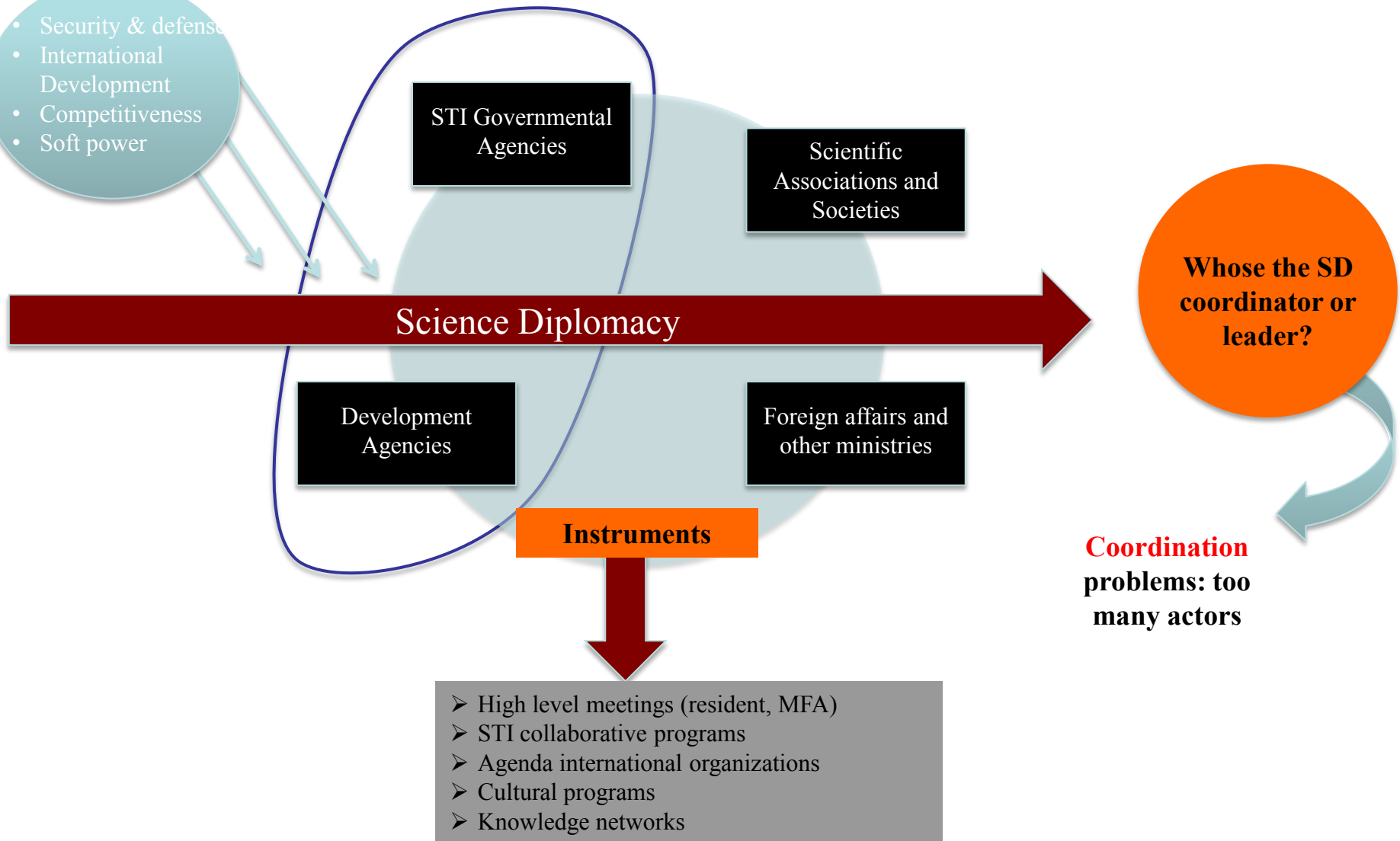
Scientific vs. Political rationales

Lack of robust funds

How do we see the SD model in developed countries?

Evident link between science and IR

- Security & defense
- International Development
- Competitiveness
- Soft power



How do we see the SD model in Latin-American countries?

Incipient link between science and IR

- Looking for funding and legitimation
- Economic competitiveness
- South-South cooperation

Ministry of Foreign Affairs

National organizations of STI

Science Diplomacy (looking for a partnership – catching-up)

Cooperation agencies

Ministries of industry and commerce

Coordination, lack of global vision, agenda-setting problems

Instruments

- Diplomatic commissions
- STI collaborative programs
- Agenda international organizations
- Cultural programs
- Knowledge networks

Roles of STI policy advisory bodies?

2. STI policy advisory agencies in Latin American countries

- Consejo Nacional de Innovación y Competitividad – CNIC ([National Council of Innovation & Competitiveness](#)), Chile, 2005
- Foro Consultivo de Ciencia y Tecnología ([Science & Technology Advisory Forum](#)), Mexico, 2002
- Centro de Gestao y Estudos Estratégicos –CGEE ([Centre for Strategic Studies & Management of Science](#)), Brazil, 2001
- Observatorio Colombiano de Ciencia y Tecnología – OCyT ([Colombian Observatory of S&T](#)), Colombia, 1999

- Not-for-profit
- Social or civic associations
- Own staff
- Public-private partnerships
- Closely related to government, but
- Independent, autonomous

Technical studies:
evaluation,
foresight,
indicators

Strategic thinking
and
planning

**Identified functions
for STI policy advisory
agencies
(Mexico, October, 2013)**

Science
diplomacy
???

Advise,
consulta-
tion

Lobbying,
advocacy,
give voice

Coordina-
tion and
articulation

ILACTI Initiative, (Latin-American Integration in STI), coordinated by CGEE (Brazil)

To propose concrete cooperation initiatives among Latin-American countries through bilateral and multilateral projects in order to develop and consolidate techno-scientific competences and innovation

Microelectronics

Energetic efficiency

Natural disasters
prevention

Health industrial
complex

Infrastructure
(Broadband,
telemedicine and digital
inclusion)

Infrastructure
(multiproposal
laboratories)

Assistive technologies

Waste recycling of electric & electronic devices

Elaboradores del Perfil



Brasil



Costa Rica



Chile



Peru



Colômbia



Adhirieron



Brasil



República Dominicana



Equador



Peru



Nicarágua



México



Colômbia



Venezuela



Argentina



Peru

Project Objectives:

- Developing of technological options for decreasing the environmental impact of recycling PC screens
- Technological consolidation of the inverted chain in electronics in Latin-America and the Caribbean
 - Developing processes for reducing waste manipulation risks and promoting the social inclusion

Some questions about the role of STI policy advisory bodies in SD

Could these bodies provide evidence for SD?

- How to improve informed international negotiations
- How to identify the expansion of science in every aspect of foreign policy?
- How is the link between STI policies and diplomatic policies?

Lack of expertise in MFA and S&T national organizations
Evaluation of scientific collaboration and feedback to public policies

Could they play any coordination role?

- How to articulate international cooperation instruments in order to perform strategically?
- Who provides information for connecting people and resources in a global and international arena?

Negotiations lead by scientists vs negotiations coordinated by policy-makers

3. Consultation Workshop

Cooperation among S&T agencies in Latin America and the Caribbean: advancing an agenda on research and innovation for development

Bogotá, Colombia, February 27 – March 1st, 2013

**International Development Research Centre – IDRC
Observatorio Colombiano de Ciencia y Tecnología – OCyT**

15 countries participated,

Objectives

General

- To open an space for discussion and cooperation among science, technology and innovation (STI) granting agencies, in order to analyse new policies and instruments to promote research and innovation for inclusive development.

Specific

- To discuss the studies commissioned by the IDRC on financial instruments for STI and on policy instruments for STI and inclusion in the region.
- To discuss the role of public STI granting agencies in the region regarding [south-south cooperation](#).
- To discuss the role of public STI funding agencies regarding new policies and instruments for promoting research and innovation for inclusive development.
- To discuss [new ways to cooperate among S&T agencies](#).
- To discuss [good practices on international collaboration](#).

Conclusions: four topics related to SD

Capacity Building

- Scientific diaspora
- Contracting of foreign scientists
- Management of large international projects
- Infrastructure for STI (“big” science)

Governance of Innovation Systems

- Monitoring of global affairs and its influence and impact in national policies
- Learning good practices

South-South Cooperation

- Setting-up cooperation agenda for Latin-American countries
- South-south vs. North-south cooperation
- Incipient bilateral and regional funds
- Participation in networks and collaborative projects

Innovation for Social Inclusion

- Scientific knowledge for solving socio-economic problems
- Coordination between development and S&T agencies

Recommendations and demands

- To promote a school for training decision-makers on STI policy in Latin-America and the Caribbean (LAC).
- To consolidate an information network on STI for researchers and decision-makers.
- To promote studies and activities for the comparison of horizontal cooperation instruments between Latin-America and other regions (Africa, Asia).
- To document experiences about innovation and technological cooperation (links between firms and government).
- To design an ongoing consultation mechanism for policymakers on innovation for social inclusion (policy analysis).
- To design and implement a mechanism for the monitoring and promotion of international cooperation experiences on STI between the different countries of LAC.

**THANK YOU
VERY MUCH FOR
YOUR ATTENTION!**

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**The evolving S&T landscape
for development in the South**
Trends & Perspectives: South Asia

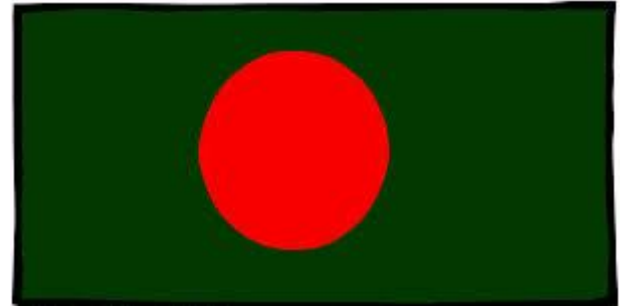
Sagarika Bose
CSPC 2013, Toronto
21 November 2013

SOUTH ASIA



South Asia: Overview

- S&T activity started during colonial period, but real thrust after independence; focus largely on agriculture, medicine and other development related fields
- Government is biggest source of funding for PSR in the region either directly or indirectly.
- Last couple of decades have seen some growth in private sector contribution to PSR
- Private sector contribution to GERD highest in India (~33%) and Sri Lanka (~20%)
- Sectors which interest private sector most
 - **India** : agriculture, automobiles, biotechnology & pharmaceuticals , ICTs, renewable/clean energy
 - **Sri Lanka**: agriculture and nanotechnology
 - **Bangladesh & Pakistan**: agriculture
 - **Nepal**: low engagement



**COUNTRY SPOTLIGHT:
BANGLADESH**

Overview

- S&T expenditure 0.3% of GDP and R&D expenditure was 0.027% (2005).
- Research output highest for agriculture and medical research
- Private sector investment is limited, with the exception being the agricultural and climate sciences sectors
- Non-governmental funding stems from international non-profit sector and indigenous companies (for agriculture)
- Private agricultural R&D in Bangladesh has expanded between 1999 and 2009 (more than PSR), especially in the seed industry
- Technology transfer appears to have motivated in-country R&D in agriculture.

Agreements with OECD

- **Japan:** JICA and JST lead research programs relating to public health and disaster management and mitigation. Multiple inter-university agreements also exist between universities in Japan and the University of Dhaka
- **USA:** Signed a broad-based S&T agreement in 2003 which has been extended. Focus on agriculture, medicine, and climate sciences
- **UK:** Engineering and Physical Sciences Research Council (EPSRC) and the Government of Bangladesh universities and institutes will partner with colleagues in Bangladesh to develop research projects on renewable energy, and work relating to energy technologies, systems, services and policies





COUNTRY SPOTLIGHT: INDIA

Overview

- Since liberalization, India has become an attractive partner (emerging economy with availability of highly skilled personnel) for bi-lateral research partnerships for countries such as Australia, Germany, Israel, UK and the US.
- GERD is 0.88% in 2012-13 and pvt sector contribution is ~33%
- About one-third of the Global 1000 R&D spenders have centres in India
 - About 30% companies with HQs' in EU are in India and about 15% which have their HQs' either in Japan or APAC, are in India
- Domestic private sector research interest in agriculture, automotives, biotech, pharma, ICTs, renewable energy, etc.
- Companies spend a fraction of their sales, less than 1%, on R&D.
- R&D expenditures rising in pharma and automobiles

Overview (contd.)



- **Agriculture**

- Since mid-90s, R&D spending by private sector has increased fivefold and currently accounts for over 30% of total research funding
- Focus on high pay-off sectors: seed, farm machinery, animal and plant health, and agro processing and farm machinery
- Private research has helped increase Indian agri exports, e.g., export of hybrid rice seed developed by Bayer, Pioneer, Bioseed, Mahyco, Advanta, and Devgen, to South and Southeast Asia

- **Biotechnology**

- Maharashtra Hybrid Seeds Corporation (Mahyco) funded hybrid rice research at ICAR in the 1990s
- JK Agri Genetics successfully developed a Bt gene in 2006 in collaboration with IIT Kharagpur



Examples of Regional Cooperation

- **Bangladesh**
 - Public health (cholera and other viruses), food technology, biotechnology, composite materials, communication technology, climate science, waste management.
- **Sri Lanka**
 - Bi-lateral agreement to boost S&T research
 - Focus on food science & technology, nuclear technology applications, oceanography and earth sciences, bi-technology & pharmaceuticals, material sciences, medical research including traditional medicinal systems, spatial data infrastructure and space sciences



Cooperation with BRIC countries

- **Brazil**

- Biotechnology, Bioinformatics, Human health, Climate research, Renewable energy, Space science, Marine science, New materials and Industry research partnership.
- Proposed India-Brazil Science Council

- **Russia**

- Integrated Long Term Programme of Cooperation in Science & Technology (ILTP): oil and gas, energy, information technology, telecommunications, pharmaceuticals, chemicals, fertilisers, mining, nuclear energy, space research

- **China:**

- Joint R&D projects in advanced manufacturing technology, natural disaster mitigation oceanic studies



Cooperation with OECD countries

- **USA**

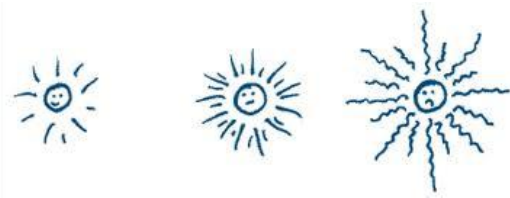
- Under Partnership to Advance Clean Energy (PACE) umbrella, the U.S. Department of Energy (DOE) and the Government of India have established the Joint Clean Energy Research and Development Center (JCERDC).
- Three point focus: Solar energy; Biofuels; Energy efficiency in buildings

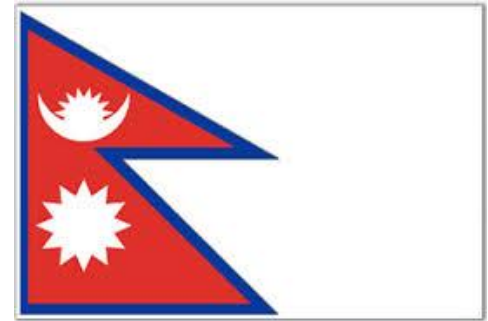
- **United Kingdom**

- The IU-ATC (India-UK Advanced Technology Centre of Excellence in Next Generation Networks, Systems and Services).
- It is a virtual joint research initiative to support collaborative PhD, Post Doctorate projects and joint research programs, and technology transfer between the UK and India.

- **Germany**

- Focus on Advanced Manufacturing (advanced materials, design engineering, rapid prototyping, sensors for manufacturing, nanotechnology), and Environmental Technologies (water, climate/resources, sustainable land management)





**COUNTRY SPOTLIGHT:
NEPAL**

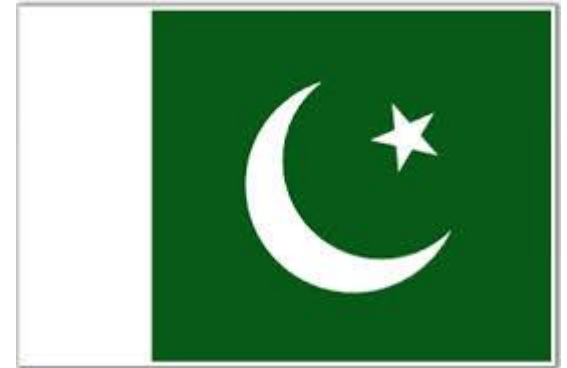
Overview

- Nepal spends 0.37% (2009) of its GDP on research on science and technology.
- S&T graduates of reasonable size (24% of all graduates) but brain drain is a major problem (worst in South Asia)
- PSR focus is most on medicine, followed by agriculture and biological sciences.
- Private sector
 - Limited interest in agriculture and biotech (medicinal plants), alternate energy and medicine R&D
 - 97% of industry comprises cottage industries and SMEs
 - Innovation and R&D are negligible because of small scale of companies, limited human resources, limited funds, and lack of supportive policy environment

Bi-lateral agreement: Australia

- Bilateral S&T agreement between NAST and Australian S&T bodies
- Australian Government to support research in the agri-biotech and climate research
- Fellowship scheme for Nepali scientists with the objective of capacity building





**COUNTRY SPOTLIGHT:
PAKISTAN**

Overview

- Political economy inhibited growth of S&T temper and investment on R&D and HRD have been limited post Independence
- R&D expenditure stagnated for decades until the 2000s and has rapidly grown since
- GERD is 0.64% and business accounts for <10% of this
- ~60 percent of R&D budget is spent on defence research; the rest goes to research at universities and R&D organisations
- Contract R&D between industry and universities is limited due to absence of incentives and bridging institutions as well as limited R&D dialogue between government and multi-nationals for technology transfer and to establish R&D facilities.
- Funding to agriculture, social sciences and other fields related to development come primarily from international agencies
- Private companies funding agriculture account ~6% of R&D in the field

Select S&T Cooperation

- **USA**
 - Themes for S&T cooperation include education, health, nutrition, water/sanitation, agriculture, democracy and governance, environment, energy (especially renewable forms), social sciences, and economic development.
 - Cooperation comprises technology commercialization; identification of new technologies with potential market value; scale up prototypes; provide training and mentorship on technology transfer; etc.
- **Australia:** Australia's aid focuses on health, education, and agricultural and rural development.
 - Australia–Pakistan Agriculture Sector Linkages Program (ASLP): build capacity of the Pakistan R&D and extension system in areas such as dairy farming.





COUNTRY SPOTLIGHT: SRI LANKA

Overview

- GoSL recognises technology innovation and R&D as of prime importance to alleviate poverty and for overall development
- GERD is 0.11% although total spending has consistently increased
- Sri Lankan government invests over 70% in R&D.; private sector ~20%; 4.3% international sources.
- According to the UNESCO Science Report 2010, Sri Lanka leads other countries in the South Asia region (even India) on World Bank's Knowledge Economy Index (KEI).
- Research output in field of medicine is highest followed by agricultural and biological sciences.
- Private sector:
 - Contribution in R&D almost tripled in the last decade
 - Interested mostly in agricultural R&D (export crops, rice, vegetable seeds and floriculture)
 - Nanotechnology

Case of Nanotechnology

- SLINTEC
 - Sri Lanka Institute of Nanotechnology (SLINTEC) Pvt. Ltd. is a Private Company formed through a Public-Private Partnership between GoSL and five leading companies (MAS, Brandix, Hayleys, Dialog Axiata and Loadstar)
 - SLINTEC engaged in nanotech research focusing on: Apparel, Rubber, Agriculture, Activated Carbon and Consumer Products.
- Malaysia:
 - GoSL has set up a Technology Development Fund with the Malaysian Technology Development Corporation
 - Finances commercialization of prioritized research, provision of research infrastructure and incubator facilities, and the acquisition of new technologies
 - The Fund to: provide research grants to companies; support cluster development, incentivizes HRD & training; build PPPs

THE EVOLVING SCIENCE AND TECHNOLOGY LANDSCAPE FOR DEVELOPMENT IN THE SOUTH AND THE MODELS AND OPPORTUNITIES FOR SCIENCE DIPLOMACY

5th Canadian Science Policy Conference
20th to 22nd November 2013

National Commission for
Science, Technology and Innovation

Introduction

- × Globally, Science and Technology -Key driver for economic development
- × Science and Technology to support developing countries attain industrial development agenda
- × Integration of science and technology in national production processes is foundation to successful implementation of national policies and strategies
- × Developing countries already have basic roadmaps eg MDGs

Current Challenges to Development

- × 2010- Primary net enrolment ratio (%) Kenya 83; SSA 76; world 89
- × 2010- Lower secondary gross enrolment ratio (%) Kenya 91; SSA 47 World 82
- × 2010 -Primary pupil-teacher ratio Kenya 47; SSA 43; World 24

Poor performance in Science, Mathematics, ICT in SSA due to 1) limited facilities for teaching; 2) large classrooms; 3) lack of qualified teachers; 3) inadequate teacher training programs (in-service)

Source: UNESCO Institute of Statistics Fact Sheet 2012

WORLD BANK WORKING PAPER NO. 101, 2007

Current Challenges to Development..

- × poorly equipped laboratories; overcrowded lecture rooms; gender disparity; lack of co-operation and partnerships with other institutions at national, sub-regional, regional and international levels ; lack of linkages between academic research and private sector hampering socio-economic progress.
- × **Low scientific productivity:** Sub-Saharan Africa produced just 11,142 scientific articles in 2008 share of the world's output scientific publications was just 1.1% . SA has 46.4 %; Nigeria 11.4% Kenya 6.6% scientific articles
- × **Inadequate funding for R&D-** SSA current expenditure < 1% of GDP SA 0.94 Kenya 0.5%

Science and Technology Policy Issues

- × **Capacity Building** – offer more training opportunities from 100 PhDs to 1000 PhDs p.a. in Kenya
- × **Policy and Regulation** – implement existing policies
- × **Investment in ST&I** – Kenya has approved 2% GDP
- × **Collaboration and Linkages** - Kenya/SA; Kenya/JSPS; AKTP; AFRA
- × **National Priority Areas**- already identified in most countries thro' consultative processes Kenya Vision 2030; Rwanda Vision 2020; SA -Ten Year Innovation Plan

Science Diplomacy – Possible Areas

- × **Capacity Building in emerging science and technology areas** such as nanotechnology, biotechnology, nuclear science, space science
- × **Investment in Science, Technology and Research**
- × **Competitive Grants for science, technology and research**
- × **Commercialisation of Research – IP, innovation; incubation**
- × **Socialization of science and Technology forecasting**

Opportunities & Models

- × Food Security - SSA's persistent food insecurity and vulnerability to famine; apt model should consider related issues such as population growth, climate change, dependence on rain-fed agriculture, low technology application, water scarcity.

Possible Solution: Value Chain Approach

- × Multi-thematic focus human health, nutritional security and environmental sustainability
- × integration of indigenous and institutional knowledge;
- × assessment of policies and institutional arrangements, as well as knowledge, science and technology
- × building capacity through technology and knowledge transfer on drought monitoring and forecast systems (climate change, hydrological models and remote sensing)

Opportunities & Models-Health

- ✘ Disease burden HIV/AIDS (Adult HIV prevalence in 2010 6.2% in Kenya), Malaria (causes 20% of deaths of children under 5 years), tuberculosis, cancer (incidence is about 28,000 p.a.); high child/maternal mortality rates;
- 1. insufficient numbers of training programmes and institutions
- 2. SSA has low nos. of personnel and healthcare services to address the many healthcare problems of the region. 10 physicians, and 20 beds, per 100,000 patients
- 3. Poor facilities
- ✘ Capacity building of health workers
- ✘ Joint vaccine development initiatives
- ✘ Science-based **health** innovation; lower-cost technological innovations
- ✘ Innovative healthcare solutions e.g. telemedicine - to improve access and reduce costs

Opportunities & Models

- × Natural resources – in almost half of SSA countries non-renewable natural resources such oil, forestry, mining account for over 25 percent of total exports.
- × Oil: Nigeria, Ghana, Uganda, Sudan, Kenya?
- × Coal: Mozambique, Kenya?
- × Diamonds: SA, Botswana
- × Gas: Mozambique, Namibia, Tanzania?
- × Iron Ore: Guinea, Liberia; Tanzania?

Opportunity:

Capacity building (funding and technical support) for sustainable exploitation of new found wealth

Commercialisation of Research Results

Models to the commercialisation of research results:

- × Start-up companies – especially from public research
- × Open Science – publication and dissemination of research results to society esp. health, water, sanitation
- × Technology transfer – use of IP, licensing

Science Diplomacy – Approaches

- × Consortiums – made up of private sector, academia, NGOs and policy makers
- × Partnership e.g. PEER program, Canada's Global Partnership Program
- × Collaboration – sharing of facilities, data, information; organisation of joint meetings
- × Science and Technology Counsellors – having S&T sections in diplomatic missions e.g. Swissnex and the Center for Science Diplomacy of the American Association for the Advancement of Science (AAAS)
- × Research Chairs – to develop capacity in specific areas
- × North–South and South-South scientific exchange

Conclusion

- × Globalization has led to emergence of common scientific and technological issues that transcend borders. e.g. climate change, nuclear technology, biosecurity, water and sanitation, and communicable diseases.
- × Effective Science Diplomacy programmes are long term and require a political commitment and allocation of adequate resources.
- × Science diplomacy has the potential to address health related issues, security concerns, conflicts over resources, emerging technologies, and environmental conservation.



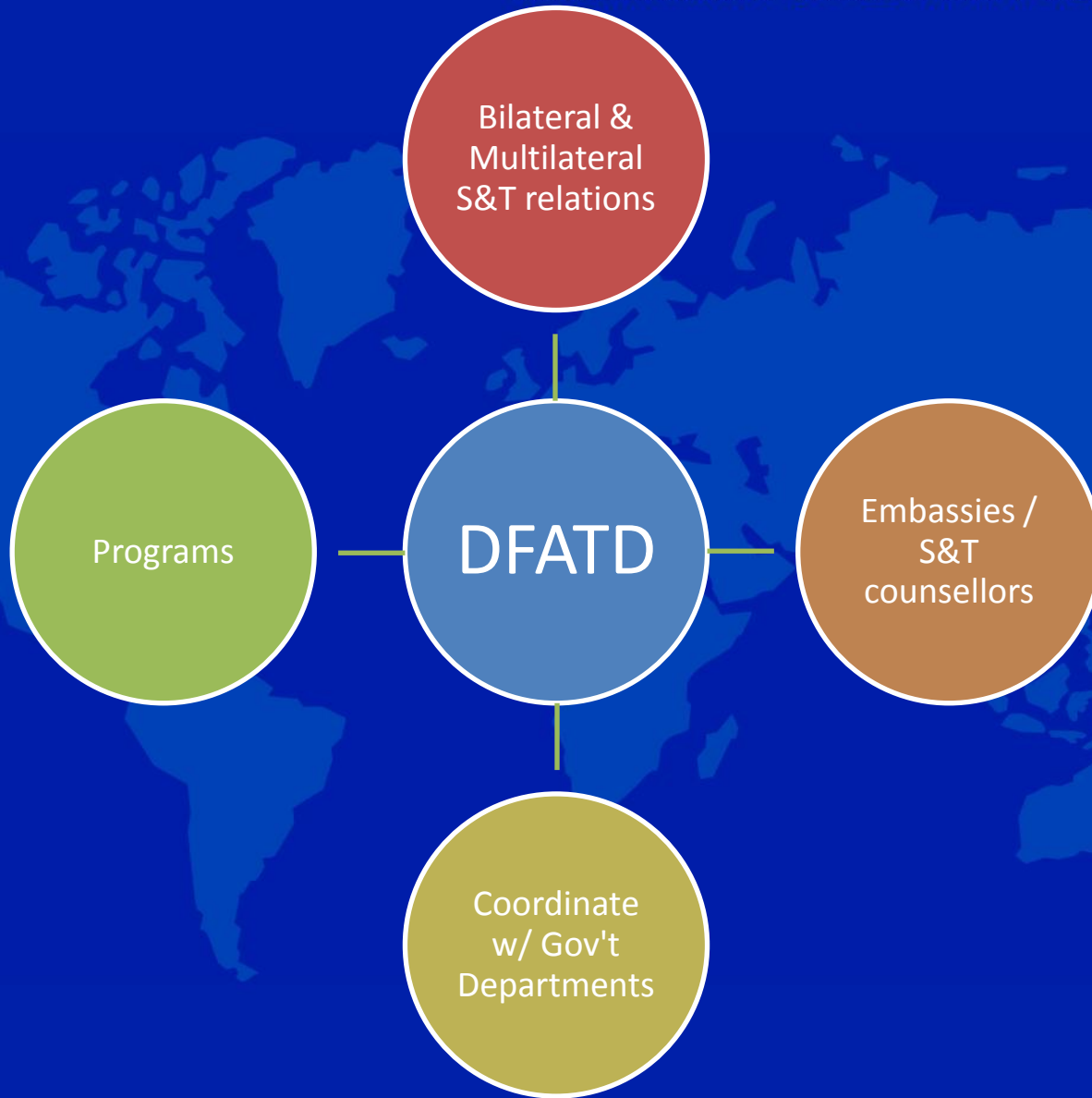
Thank you

www.nacosti.go.ke

IDRC & Federal Models for SD

Outline

- Science Diplomacies in the federal system
 - Multiple agencies w/different models
- IDRC's models
 - How we work
 - How we might work









IDRC Models

- Evolving models
- Core program
 - Researchers & research performing organizations
- Collaborative Program
 - In-Canada
 - Public/Private
 - Bilateral (development cooperation, OECD)
 - Bilateral (gov't funding agencies, non-OECD)

Discussion

- What models are working?
 - Supply/demand issues
- What might Canada do / might do differently?
- What might IDRC do / do differently?