

South-South Cooperation: ROLE OF SCIENCE DIPLOMACY



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विकासशील देशों की अनुसंधान एवं सूचना प्रणाली

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Core IV-B, Fourth Floor, India Habitat Centre,
Lodhi Road, New Delhi-110 003, India
Ph.: +91-11-24682177-80, Fax: +91-11-24682173-74
E-mail: dgoffice@ris.org.in
Website: www.ris.org.in

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Science Diplomacy for Enhancing India-Afghanistan Co-operation in Higher Education



Abdulhakoor Salangi*



Mohammad Sarwar Ahmadzai**



Mir Zabiullah Mirzad***



Shajia Taher Elham****

Introduction

India and Afghanistan have a strong relationship based on historical and cultural links. The relationship is not limited to governments in New Delhi and Kabul; it has its foundation in the historical contacts and exchanges among the people of both the countries. Indo-Afghan relations have been strengthened further by the Strategic Partnership Agreement signed between the two in 2011. Hence, it is no wonder that India has rendered support by making a long-term commitment to higher education and economic development of Afghanistan.

India has also played an important role in Afghanistan higher education development since its independence; despite turbulent situation in Afghanistan, India has never stopped giving support and assistance in the field of higher education to Afghanistan. Since 2001, thousands of Afghan students have been coming to India for higher education. This has played a vital role in the development and reconstruction of Afghanistan. Many scholarships are being provided to Afghan students, and training modules are being implemented for professors from Afghanistan. Assistance is given to Afghanistan government of in the field of higher education.

Higher Education in Afghanistan

Although there has been much progress in this since 2001, the country still has a long way to go to reach to the levels prevalent in neighbouring countries. Low literacy rate, particularly, among women, lack of access in many areas for reasonably good education and quality of education are some of the maladies

*Head of Uzbekistan Department, Academy of Sciences of Afghanistan, Afghanistan

**Researcher and Director of Mahood Tarzai Think Tank, Academy of Sciences of Afghanistan, Afghanistan

***Political Officer, Ministry of Foreign Affairs, Afghanistan

****Member, Ministry of Foreign Affairs, Afghanistan

plaguing higher education sector. In fact, higher education is given importance by donors and by agencies like World Bank. But support from them in addition to government efforts is not adequate while considering the need. As the economic development is not possible without human resource development, and only adequate availability of human resource can facilitate reconstruction and transformation of Afghanistan, there is thus the obvious need for higher education. The number of students enrolled for higher education are 300,000 compared with 7,900 in 2001. The number of public and private universities have increased; and presently there are 36 public universities and more than 100 private universities¹. However, the critical issue is that of quality of faculty in higher education, as it has been observed that hardly 5 percent of the faculty have PhD degree, and a very few public universities offer PhD programmes. Even a random look at the data would indicate that these institutions are nowhere near the better institutions in the neighboring countries in terms of infrastructure, research and publications, diversity in programmes and quality of education offered to students.

But the situation is not so hopeless to be improved. Given the surge in rate of literacy and increase in enrollment in primary, secondary and higher secondary education, the demand for enrolment in higher education would go up. So we need a virtuous cycle on higher education. Although there are many agencies and countries involved in supporting growth of higher education in Afghanistan, India is playing a unique role, as has been explained in the subsequent paragraphs. This role has to be expanded and diversified.

India-Afghanistan initiatives for Higher Education in Science

a. Afghan Scholarships and Fellowships Programmes

In 2001, India initiated assistance to Afghanistan higher education, and provided scholarships to

Afghan students to study in India. Some of the scholarships for higher education in sciences are as follows.

ICCR Scholarships

The Scheme is sponsored by the Indian Council for Cultural Relations (ICCR), an autonomous body under the administrative control of Ministry of External Affairs, New Delhi. The nodal agency for administering the scheme in Afghanistan is the Ministry of Higher Education. Under the scheme, every year a total of 1,000 scholarships are offered to Afghan nationals pursuing undergraduate, postgraduate and Ph.D. courses in Indian universities.

ITEC Fellowships

The Indian Technical and Economic Cooperation (ITEC) Training Programme is sponsored by the Technical Cooperation Division, Ministry of External Affairs, New Delhi, and is administered by the Independent Administrative Reforms & Civil Service Commission (IARCSC), Afghanistan. The objective of this scheme is to train middle-level public officials of the Afghan Government Ministries/Department/Semi-Government organizations. A limited number of seats are open to private/business organizations. During Indian Prime Minister's visit to Afghanistan in August 2005, the number of fellowships increased from 200 to 500. Over 200 training courses are offered in different fields of Business Management, Journalism, IT, Legislative training, power distribution, English speaking and writing skills and business communication; Tools Design; Bio medical/ optical/ ophthalmic equipment, Audit (PSE/Disinvestment/IT/Environment/Energy), Flow measurement and control techniques, Urban planning and management, Mass Communication, Power plant management, HR planning, Manpower research, Engineering (Civil/mechanical/agriculture), Accounts, Agriculture and Rural development, Logistics and supply chain management; Textile management; Prevention of HIV/AIDs etc. The duration of the courses varies from 2 to 52 weeks.

ITEC Fellowships

Academic year	No. of ITEC trainees
2006-07	498
2007-08	428
2008-09	375
2009-10	449
2010-11	372
2011-12	455
2012-13	448
2013-14	411
2014-15	386
2015-16	318

Colombo Plan

This training scheme is offered by the Indian Ministry of Finance to many developing countries, including Afghanistan for short-term trainings; 20 slots are allotted every year for Afghanistan.

Its objective is to train middle-level officials of the Afghan Government Ministries/ Departments/Semi-Government organizations. Comprehensive and integrated training is provided to participants to enhance their administrative and technical capabilities.

Number of courses are being offered under this scheme for a duration of 1-3 years on different themes, including standardization and quality assurance, parliamentary internship, Sustainable crop production, livestock management, footwear design, stones mechanics, marine fisheries, plastic processing tools, poultry management, leather processing, intensive biotin, silkworm, PG Remote sensing, IT, general insurance, audit, oil and gas flow measurement, urban development, hydrology, molecular biology, etc.

Self-Finance Schemes

This scheme is meant to facilitate Afghan national willing to pursue higher professional studies at their own expenses in the courses. The criterion for admission varies. It is not automatic, and often students have to take entrance examination or prove that they are eligible otherwise. For example, since academic year 2017-18, foreign candidates are to appear for a National Eligibility cum Entrance Test (NEET), conducted by CBSE

for admission in MBBS/ BDS UG courses in the India. The scheme is suitable for Afghan citizens, who can afford the expenses for the courses. While higher education in India is definitely cheaper when compared to the USA or Europe, still it is beyond the reach of many aspiring students from Afghanistan. It is suggested that there should be a comprehensive review of this. Both governments can consider bringing some flexibility in this and in the provision for providing subsidies, loans and offering more number of scholarships to meet the demand.

b. Institutional Collaborations

National Agriculture Science and Technology University in Kandahar

In February 2014, Afghan President Hamid Karzai and Indian Foreign Minister Salman Khurshid inaugurated the National Agriculture Science and Technology University in southern Kandahar province of Afghanistan. The establishment of the University is one of the major capacity-building projects undertaken in Afghanistan with the financial collaboration from Indian government. The university would have include departments of pedagogy, plants protection, forests and agricultural economy. Moreover, animal husbandry department entails department of food studies, department of veterinary and other departments. The university has been established with the support of \$500 million pledged by India for the agriculture sector. And the university has been built with a budget of \$60-70 million from the grant. The university aims to provide right education and training to cadres and specialists in the field of agriculture. Lack of specialists has been a major constraint confronted by the Ministry of Agriculture. Afghanistan is an agricultural country, and farming forms the pillar of the country's economy.

India-Afghanistan Foundation

India-Afghanistan Foundation (IAF) is a trust fund set up by the Governments of India and Afghanistan to finance projects aimed at fostering India-Afghanistan relations through enhancement of economic, scientific, educational, technical as well as cultural cooperation. The IAF

was established in April 2007 with the signing of an MoU between India and Afghanistan for fostering Indo-Afghan relations through the enhancement of economic, scientific, educational, technical and cultural cooperation and promotion of greater understanding among the peoples of two countries. The management and direction of the Foundation is vested in a Board of Directors, consisting of 10 members. Ambassador of India to Afghanistan in Kabul and Ambassador of Afghanistan to India in New Delhi are Co-Chairpersons of the Board. The other eight members are nominated by the two Governments.

The thrust areas identified for promoting understanding and cooperation are education and culture, archeological studies, agricultural research, science and technology, health, technical training, developmental studies and women's studies. The programmes of IAF include the following:

- Facilitating visits and exchanges between India and Afghanistan of scholars, academics, professionals, artists and experts involved in the areas of activities covered by the Foundation.
- Assisting activities such as seminars, symposia, colloquia and workshops on the subjects of common interest.
- Extending financial support to those non-governmental organizations both in India and in Afghanistan whose work facilitates achievement of the objective of the Foundation.
- Contributing towards publication of standard works on India-Afghanistan relations in specified fields.
- Encouraging translations of standard works of Afghanistan literature into Indian languages and *vice-versa* and arranging for their publications

Challenges

Cooperation between Afghan and Indian Governments in the field of higher education has increased but it is not sufficient, particularly, in science and technology disciplines. Compared to the number of students who are interested in pursuing higher education in India, the number

of seats made available to them is much less, particularly, in central universities like JNU. Cooperation among private sector educational institutions in Afghanistan and accredited/recognized private universities in India is very weak. There is good potential but it is virtually unexplored. Most of the Afghan students coming for studies to India are selected by the ministry of higher education of Afghanistan on the basis of merit. But for many reasons their competence in English is far from adequate. Addressing this issue is important for both the countries.

Science Diplomacy and Higher Education

One of the objectives of Science Diplomacy is use of science to further objectives of foreign policy. If the foreign policy of India is to promote growth and development in India across sectors and to enable Afghanistan to catch-up with other countries in the region in higher education, then Science Diplomacy can be used to support creating capacity in higher education, particularly in science and technology. For this, India needs to review its current programmes of support in higher education and need to replace them with a comprehensive programme that would give more impetus to science and technology education. India has institutions that are globally renowned in science and technology, and its S&T capability is well known. The higher education in Afghanistan can benefit from these institutions, if S&T gets major support in the programmes. In this regard we suggest the following.

- India can encourage its top ranking institutions in S&T to establish institutions in Afghanistan and rapidly develop the capacity.
- Incentives for co-operation with Afghanistan can be granted to accredited and top-ranking private universities.
- Special emphasis should be given to setting-up through collaboration for institutions to impart training to trainers and for developing faculty .
- Instead of having many programmes that enable students from Afghanistan to apply and benefit, there should be a single and comprehensive programme with a scope for expansion over the years

Conclusion

As participants of an ITEC programme, it is suggested that India should consider using Science Diplomacy to help Afghanistan in developing its higher education system. Some suggestions have been chalked out. We hope that both governments can do more than what is achieved so far.

Endnote

- 1 <http://blogs.lse.ac.uk/southasia/2017/12/12/the-role-of-higher-education-in-economic-development-of-afghanistan/>



Science and Diplomacy: Case of the Algerian Space programme

Introduction



Bouzid Aouatef
Hanane Faraoun*



Yousfi Zergot Karima**

Science Diplomacy is not a new concept but a tool needed for growing number of countries. It developed its first form in the US in the early 1960 and has mainly spread across Northern Europe and among English-speaking countries. As a concept, the theme “Science Diplomacy” is still unknown within French-speaking countries¹

I-Diplomacy: Art and practice of conducting negotiation between nations and application of foreign policy of a state or a government.

II- Science: Organization of the knowledge related to different categories of facts, objects or phenomena seen as:

- obeying to natural or social laws and/or verified by experimental methods and
- giving to this knowledge the format of testable explanations and predictions.

Its scope is extended (but no more restricted) in religious communities to some non-verifiable elements of cognizance, inherited from Elders.

These two types of knowledge can intermingle, as in the case of the “ancestral knowledge”, presently exposed essentially through the medical interest of some plants, from which active molecules are extracted by pharmaceutical laboratories, or in the case of hygienic importance of some traditional practices, like yoga.

“Science Diplomacy” is the name given to an international, interdisciplinary and inclusive process involving integration to balance national and global interests. For developing countries, like Algeria, it involves two major areas of focus:

*Deputy Director, Ministry of Foreign Affairs, Algeria

**Deputy Director, Ministry of Foreign Affairs, Algeria

education and research, while in most advanced communities, a third area has emerged, i.e. “leadership”. In the Algerian context, the concept of “Science Diplomacy” aims mainly to educate next generation of diplomats to sciences and technologies handling; to facilitate research that reveals evidence and options that contribute to informed decision-making; but in other countries it can also provide leadership with networks that build common shared interests across the world. But as well-defined in Wikipedia, even if “*many experts and groups use a variety of definitions for science diplomacy (...), science diplomacy has become an umbrella term to describe a number of formal or informal technical, research-based, academic or engineering exchanges*”.

In the present Algerian interpretation, the term “science” covers a number of areas apparently restricted to:

- Engineering Sciences;
- Fundamental Research;
- Knowledge linked to Agronomy, Nature and Environment;
- Medical sciences;
- Physics and Mathematics; and
- Social Science.

Algeria, among most other developing countries, recognizes the role and importance of science in socio-economic development and its impact in the reinforcement of international relations and interactions (mainly through what is designated as “technology transfers”, and which essentially means “knowledge sharing”). In consequence, its Foreign Affairs department is progressively considering inclusion of scientific component in the international negotiations and discussions and in its internal normative organization and charts.

Conceptual Framework of Science And Diplomacy

Science diplomacy is at the crossover of two disciplines, diplomacy and science (foreign policy, negotiation, research and knowledge), and can be defined as “*the use and application of scientific cooperation to help establish links and strengthen*

relations between societies, especially in areas where there may be no other means of official level approach”.

The need of SD is increasingly growing. Indeed, modern world requires effective partnerships among scientific policy-makers and diplomats to face global challenges of climate change, food safety, nuclear risks, continuous access to affordable and safe energy, water shortage and apparition of new diseases, and so on.

Hence the importance of integrating scientific discourse into diplomatic negotiations and including scientific discoveries among parameters aiming at proposing solutions to the global challenges and to achieve SDGs.

So, diplomats have to ensure that their approach focuses not only on science, but also on technology, and that it builds synergies with both the “economic diplomacy” and with other aspects of the global processes of integration of world economies to give life to a world in which all human beings and all peoples benefit from equal chances and closer levels of co-prosperity.

Moreover, because of its neutral and non-ideological nature, “*Science diplomacy*” should be demarked from “*cultural diplomacy*” and given an autonomous status and a tool of confluence and cooperation in the diplomatic system/apparatus. To reach this goal, we have to raise the personal interest of the diplomats on the issues relating to science, technology and general knowledge.

Algerian Involvement In Science Diplomacy

As in the majority of the developing countries, in Algeria, even if the concept of SD in itself is more or less new, it was present in the activities of the diplomats since many decades.

National action was essentially based on:

- the creation of a large cooperation between the Ministry of Foreign Affairs and the other governmental departments to make them aware of the potential of benefitting from information and experiences related to research in science, technology and innovation

in countries linked to Algeria by afferent agreements;

- the training of the diplomats themselves, through participation in workshops, conferences, symposiums, etc., relating to the new technologies or sources of knowledge, relating to SD;
- creation of networks of exchanges with foreign diplomats;
- annual offering of thousands of loans to African and Arab youngsters to benefit from the universities, academies and training facilities in Algeria.

At the level of the Algerian Ministry of Foreign Affairs, the lately programmed objective is to permit the putting on place a body of “scientific attachés” capable to:

- advise the Chiefs of Diplomatic institutions, Ambassadors as well as Ministers, on the political, security and social implications of the scientific and technological issues. The rapid introduction of the changes created from the 1980s by the involvement of new technologies in the method of diffusion and vulgarization of the information is a good example of how quickly changes to work methodologies can happen;
- share scientific and technological vulgarization with other countries seen as “friendly partners”. The further goal is to create positions of “science and technology advisers”, “scientific attachés” and “attachés for scientific and university cooperation” within the Algerian embassies in a series of targeted countries;
- allow each diplomat to represent efficiently Algeria in scientific conferences and to report accurately on the issues raised and on the manner they are dealt with;
- in a later stage, and ideally, it is hoped to create a specific “scientific attachés” service that can contribute in the creation of formal links between researchers and scientists from Algeria with its foreign partners, putting the Embassies at the centre of the scientific exchange initiatives.

It was presumed that monitoring and amalgamating role of the scientific attachés can

be jeopardized by the Internet phenomenon or by increasing number of networks and specific communities it had created. But because the validity and the reliability of these sources often is delusive, the role of scientific attachés is always imperative.

In terms of cost, putting on place a “science diplomacy” not only impacts hugely the budget of the Ministry of Foreign Affairs, but also requires a real human resource policy; with the essential immediate purpose of assuring e-communication between scientists and diplomats and mutual narrowing between usual and scientific language.

Space as an Example of Successful Science Diplomacy Cooperation

As said before, many mechanisms of cooperation in the field of Science Diplomacy have already been put on place by Algeria with foreign partners. However, the most illustrative example is that of the association of more advanced foreign scientific countries and entities to the Algerian Space programme.

Because of the visible hiatus existing between the size of its territory and its demographic resource, Algeria is obliged to use satellite tools to protect its land from negative human interferences and from natural or environmental malfunctions. In this context, and in association with the Ministry of Foreign Affairs organs, the Algerian Space Agency has carried out bilateral and multilateral cooperation actions with capable-space powers and with emerging countries.

Four government cooperation agreements have been signed with Argentina, France, South Africa and Ukraine, as well as a series of memoranda of Understanding and Cooperation have been signed with the space agencies of Russia, India (ISRO), China, the United Kingdom and Germany.

The Algerian space programme plans to put in place before 2020 a space infrastructure consisting of 12 satellites, of which a significant number should be partly or totally integrated into an Algerian center for satellite development objectives to make space tools a powerful instrument in national

prosperity in the fields of meteorology, earth observation, and communications.

In this framework, two Algerian satellites were launched from India in 2010 and 2016, and one from China in 2017. Moreover, Indian and Chinese scientists have been allowed to use Algerian tracking facilities in cooperation with Algerian scientists, who need to be confronted with foreign experiences and knowledge. In parallel, large activities of training have been opened to Algerian scientists in diverse fields, especially Global Positioning system, communications, resource mapping, meteorological services, global tracking system and post-disasters management.

Another more global successful example is given by the *“Pan African e-Network project”*, an information and communications technology programme between India and the African Union that seeks to connect 53 member states of the Union through a satellite and fiber-optic network to India and to each other to enable access and sharing of expertise between India and African states in tele-education, telemedicine, Voice over IP, infotainment, resource mapping, meteorological services, e-governance and e-commerce services. The project is one of the

biggest ever in the ICT sector in Africa, and is expected to extend ICT infrastructure to rural and underserved areas. The project is seen as an example of India furthering its economic and strategic interests in Africa through the use of soft diplomacy, and has been acclaimed as an instance of South-South cooperation, helping overcome digital divide in Africa.

Conclusion

Building relationships with other countries around science helps build trust in political and security areas, and one can use the consequences of science to put on place economic engagements as well. The old nations and States competing for everything negative, especially economic expansion and land grabbing, has to be replaced by development of more positive and open-minded channels of cooperation and sharing, the *“Science Diplomacy”* is being one of them.

Endnote

- ¹ This aspect is illustrated through the absence of any French literature on the theme in the Internet, and through the yet non-translated designation of the concept.



Argentina-India Technical Cooperation: Agriculture and Science & Technology



Maria Florencia Collados*

Argentina is a Federal Republic located in South America. Sharing the bulk of its Southern Cone with its neighbour Chile to the west, the country is bordered by Bolivia and Paraguay to the north, Brazil to the northeast, Uruguay and the South Atlantic Ocean to the east, and the Drake Passage to the south. Its capital and most important city is Buenos Aires, and its official language is Spanish.

At present, Argentina has the second largest economy in South America, and the third largest in Latin America. At the international scenario, it retains its historic status as a middle power in international affairs, and it is a prominent regional power in the Southern Cone and Latin America. In fact, Argentina has an active participation in different international organizations such as G15, G20, UN, WB, WTO, Mercosur, OAS, UNASUR, among others.

However, and despite maintaining political-diplomatic and economic-commercial bonds with a large part of the international community, its relations with traditional partners the ones prevailing are: Mercosur countries, Chile, Bolivia, United States and the European Union.

Taking into account the aforementioned, it is undeniable that the Asia-Pacific region, in general, and India, in particular, was traditionally of the secondary importance for Argentine foreign policy, a situation that began to reverse in 2003 with the arrival of Mr. Néstor Kirchner to the Presidency. This has been maintained in two Presidencies of Mrs Cristina Fernández and of the present President of the Argentine Republic, Mr. Mauricio Macri.

The redirection of Argentine foreign policy has occurred when it faced the need to reintegrate internationally after suffering a strong political and economic crisis in 2001. At the same time, and from the other side of the world, a highly attractive scenario

**Foreign Trade Officer, Santa Fe Government Investment and Foreign Trade Agency, Argentina*

emerged: the Asian boom in the world economy after the crisis of 1997-1998 and India initiating an internal process of economic reforms and an adjustment in its foreign policy resulting in its significant role on the international stage. It is important to indicate that this process was started in 1991 by Prime Minister, Narasimha Rao.

The redefinition of India's foreign policy and the model implemented after the arrival of Néstor Kirchner to power allowed intensification of the bilateral bond. Both countries prioritized, within their respective foreign policies, the diversification of relations with different countries of the international community; with Latin American and the Caribbean in the case of India and with the Asia-Pacific region by Argentina. Within this framework, the political-diplomatic and economic-commercial relations have become closer every year. At present, both countries are not only commercial partners but also strategic allies in different cooperation areas of the international policy. In this paper, we would focus on political-diplomatic relations.

Argentina and India in 1949 began to be officially linked, when the Asian country opened its Embassy in Buenos Aires. For its part, Argentina opened its Embassy in New Delhi in 1950. However, it is from the beginning of the twenty-first century that some progress was seen, after the signing of various areas agreements and Memoranda of Understanding (MoU). Following are the most relevant ones¹

- Programme of Cooperation (POC) in Science and Technology between Ministry of Science, Technology and Productive Innovation of the Argentine Republic and Ministry of Science and Technology of the Republic of India (2004)
- Memorandum of Understanding between Ministry of Agriculture of the Republic of India and the Secretariat of Agriculture, Livestock, Fisheries and Food of the Argentine Republic in the field of agricultural research (2006)
- Framework Agreement on cooperation in the peaceful uses of outer space (2010)
- Memorandum of Understanding between Argentine Geological Survey Service (SEGEMAR) and Geological Survey of India (2010)
- Memorandum of Understanding on cooperation in sports between the Ministry of Youth Affairs and Sports of the Republic of India and the Secretariat of Sports of the Argentine Republic (2010)
- Memorandum of Understanding on cooperation on foreign trade technology transfer between the Government of the Republic of India and the Government of the Argentine Republic (2010)
- Memorandum of Understanding between the National Institute of Industrial Technology (INTI) and the National Research Development Corporation (NRDC) (2010)
- Memorandum of Understanding between ONGC Videsh Ltd (OVL) and Energía Argentina SA (ENARSA) (2010)
- Cooperation Agreement between the National Council of Scientific and Technical Research (CONICET) and the Council of Scientific and Industrial Research (CSIR) (2010)
- Agreement on Cooperation in the Peaceful Uses of Nuclear Energy (2010)
- Visa Agreement between the Government of the Republic of India and the Government of the Argentine Republic (2010)
- Agreement on information exchange and tax assistance (2011)
- Customs Agreement (2011)
- Memorandum of Understanding on Establishment of an "Academic Chair" in Ayurveda between Central Council on Research in Ayurvedic Sciences, Ministry of AYUSH and Fundacion de Salud Ayurveda Prema (2016)
- Memorandum of Understanding on Cooperation in the Field of Research and Education in Homeopathic Medicine (2016)
- Memorandum of Understanding between Indian Immunologicals Limited (IIL), National Institute of Agricultural Technology (INTA) of the Secretariat of Agriculture, Livestock, Fisheries and Food of the Argentine Republic and Litoral Biológico of Argentina (2017)

The Programme of Cooperation (POC) in Science and Technology between Ministry of Science, Technology and Productive Innovation of the Argentine Republic and Ministry of Science and Technology of the Republic of India (2004) and two Memoranda of Understanding between the National Institute of Agricultural Technology (INTA) of the Secretariat of Agriculture, Livestock, Fisheries and Food of the Argentine Republic and Indian counterparts: Ministry of Agriculture of the Republic of India (2006) and Indian Immunologicals Limited (2017) have been explained in detail.

Science and Technology Technical Cooperation

The Programme of Cooperation (PoC) in Science and Technology between Ministry of Science, Technology and Productive Innovation of the Argentine Republic and Ministry of Science and Technology of the Republic of India (2004):

Bilateral scientific and technological cooperation agreement was signed in 1985, which was its foundation stone in the Basic Agreement on Technical and Scientific Cooperation between Argentinean and Indian Governments.

Within the framework of this, Programme of Cooperation (PoC) was signed in 2004 between the former Secretariat for Science, Technology and Productive Innovation of the Ministry of Science, Technology and Productive Innovation of the Argentine Republic and the Department of Science and Technology, Ministry of Science and Technology, Government of India. The main of PoC was to expand scientific and technological cooperation between the countries through the implementation of joint research projects, seminars and exploratory visits of scientists and experts from each side for establishing new contacts for the development of joint projects. The areas for cooperation were:

- Biotechnology
- Oceanography and Polar Research
- Medicine and health
- Agriculture and Food Technology

- Information technology and communication
- Renewable Energy Sources
- Manufacturing Technologies

Since the signing of the Programme, four calls were opened, 27 projects were approved and 127 people were trained in doctoral and post-doctoral exchanges. Next, there was a summary table with the selected projects for the 2014 call, the last one; some of them are being still developed.

It is worth noticing that the PoC is a clear example of the vision of the international cooperation Argentina has since 15 years through its Ministry of Science, Technology and Productive Innovation.

Since 2007, the Minister of Science, Technology and Productive Innovation, Mr. Lino Barañao, highlighted on several occasions importance of science and technology in a globalized world and need to advance in bilateral cooperation from an interdisciplinary perspective. He also indicated that the interaction with India was of a strategic value for Argentina, given the high symmetry that exists in terms of human resource but also the need of both countries to have quality research and, at the same time, solve social impact problems²

Agricultural Technical Cooperation

Memorandum of Understanding between the Ministry of Agriculture of the Republic of India and the Secretariat of Agriculture, Livestock, Fisheries and Food of the Argentine Republic in the field of agricultural research was signed in 2006.

In this, importance of science and technical cooperation was observed in the field of agriculture and agrifood. Through this MoU, both countries recognized the importance of scientific and technical cooperation in agriculture, agrifood and biotechnology as a contribution to their economic development.

MoU signatories were the Indian Council for Agricultural Research/Department of Agricultural Research and Education (ICAR/DARE) under the Ministry of Agriculture of the

Republic of India and the National Institute of Agricultural Technology (INTA) of the Secretariat of Agriculture, Livestock, Fisheries and Food of the Argentine Republic.

The specific objectives of this MoU were initiation of exchange programmes in the following areas:

- Joint cooperation and implementation of research projects :
- Visits or exchange of researchers
- Organization of study and learning visits and other forms of training
- Exchange of plant and animal genetic resources, equipment and testing material
- Exchange of publications and other scientific and technical documents.

The Memorandum of Understanding between Indian Immunologicals Limited (IIL), National Institute of Agricultural Technology (INTA) of the Secretariat of Agriculture, Livestock, Fisheries and Food of the Argentine Republic and Litoral Biológico of Argentina was signed in 2017.

This MoU is an agreement of Research, Development and Transfer of technologies from Argentina to India to deal with an animal health issue: sadness cow syndrome. It was signed by the National Institute of Agricultural Technology of Argentina (INTA), Litoral Biológico and its counterpart in India, Indian Immunologicals Limited (IIL).

As a result, INTA developed a vaccine for the disease called Bio-Jajá; vaccine was elaborated by Litoral Biológico and bought by Indian Immunologicals Limited (IIL). In fact, 100.000 units have already been exported from Argentina to India³,

The development of vaccine is a clear example of how technical cooperation has a positive impact on the economy of the involved countries. It must be taken into account that, with more than 300 million heads, the Republic of India stands out as the country with the largest cattle stock, besides being world's leading milk producer and exporter. In this sense, with the Bio-Jajá vaccine, India would not only control one of the most important health problems it has been facing, but

would also avoid great economic losses.

After this first stage of the Memorandum, an Agreement between Litoral Biológico and Indian Immunologicals Ltd. would be signed to manufacture the same vaccine in India. Later, Bio-Jajá would be exported to Far East and Africa from India, regions where IIL has a strong presence.

It is worth mentioning that the vaccine was developed entirely by the INTA, which undertook, through this MoU, to develop diagnostic methods for sadness cow syndrome, together with the Indian Veterinary Research Institute (IVRI).

Conclusion

The rapprochement between the two countries at the level of technical cooperation was in the nascent stage during the past 15 years compared to different programmes that both Argentina and India were having with their traditional partners.

However, this trend has reversed lately. Concrete examples are the two MoUs and programme mentioned in detail in the paper, aiming to intensify technical cooperation between both the countries in agriculture, science and technology.

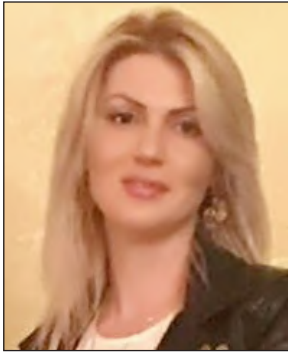
This shows that the South American and the Asian country are aware of the similarity of their challenges, complementarities of their economies and importance of South-South Cooperation in bilateral relations to achieve their greater development and to play a leading role in the international community.

Endnotes

- ¹ Embassy of India in Argentina, official website www.indembarg.in, <http://www.indembarg.in/page/relations/>
- ² Ministry of Science, Technology and Productive Innovation of Argentine Republic, official website, <http://www.mincyt.gob.ar/noticias/baranao-fortalece-la-vinculacion-en-ciencia-y-tecnologia-con-la-republica-de-la-india-9724>
- ³ National Institute of Agricultural Technology (INTA), official website [https://inta.gob.ar/inta-informa/exportan-a-la-india-100-mil-](https://inta.gob.ar/inta-informa/exportan-a-la-india-100-mil)



THE ROLE OF SCIENCE DIPLOMACY CASE OF THE REPUBLIC OF ARMENIA



Angelina Hovhannisyan*



'The man is the most important value for our country'.

– Serzh Sargsyan, The President of the Republic of Armenia

Building an efficient research system is a strategic goal for the Armenian authorities. Armenia has a number of assets, including a solid science base, a large Armenian Diaspora and traditional national values emphasizing education and skills.

The first legislative act relating to science and technology was the Law on Scientific and Technological Activity (2000). It defined key concepts concerning the conduct of research and related organizations.

In 2007, the Government adopted a key policy resolution on establishing the State Committee of Science (SCS). While being a committee within the Ministry of Education and Science, the SCS was empowered with wide-ranging responsibilities as the

*Head of Foreign Relations Division of the Ministry of Education and Science of the Republic of Armenia

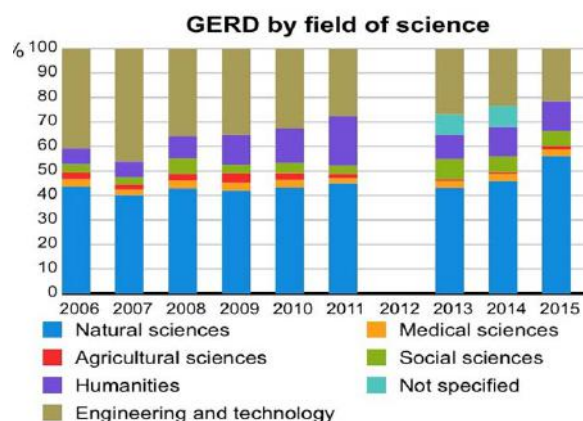
leading public agency for the governance of science, including drafting of legislation, rules and regulations of the organization and funding of science. The SCS is also the leading agency for the development and implementation of research programmes in Armenia.

The State Committee of Science prepared three key documents which were subsequently adopted by the government, and one of them was the Strategy for the Development of Science 2011–2020, which envisaged a competitive knowledge-based economy drawing on basic and applied research. The Action Plan seeks to translate this vision into operational programmes and instruments supporting research in the country. The Strategy for the Development of Science 2011–2020 envisions that “by 2020, Armenia will be a country with a knowledge-based economy, and it will be competitive within the European Research Area with its level of basic and applied research”.

The following targets have been formulated:

- Creation of a system capable of sustaining development of science and technology;
- Development of scientific potential, modernization of scientific infrastructure;
- Promotion of basic and applied research;
- Creation of a synergistic system of education, science and innovation; and
- Becoming a prime location for scientific specialization in the European Research Area
- Based on this strategy, the Action Plan has been approved by the government defining following targets.
- Improve S&T management system and create the requisite condition for sustainable development;
- Involve more young, talented people in education and research, while upgrading research infrastructure;
- Create the requisite conditions for the development of an integrated national innovation system; and
- Enhance international co-operation in research and development.

General Expenditure on Research and Development



Nonetheless, there are still a number of hurdles to overcome in building the national innovation system. The most important among them is the poor linkages between universities, research institutions and the business sector. This is partly a legacy of the country’s Soviet past, when the policy focus was on developing linkages across the Soviet economy rather than within Armenia. Research institutes and industry were part of value chains within a large market that disintegrated with the Soviet Union. Since two decades on, domestic businesses are yet to become effective sources of demand for innovation.

Armenia is implementing Science diplomacy actively by representing itself and its interests, addressing global issues and enhancing cooperation with other countries and within a number of international organizations and initiatives.

On 19 May 2016, Carlos Moedas, European Commissioner for Research, Science and Innovation, and Mr Levon Mkrtchyan, Armenian Minister for Education and Science, signed an agreement in Brussels associating Armenia to Horizon 2020. The agreement would allow researchers and innovators from Armenia to participate in Horizon 2020 under the same conditions as their counterparts from EU member-states and other associated countries.

With a budget of €77 billion for 2014-2020, Horizon 2020 is the largest multinational programme dedicated to research and innovation. Until signing, Armenia participated in Horizon 2020 as a third country. Association covers years from 2016-2020, and opens up new opportunities to the country's universities, research institutions and enterprises.

In the Seventh Framework Programme (2013-17), which preceded Horizon 2020, Armenian organizations participated in 35 signed projects. In Horizon 2020, they already have five projects.

The EU is strongly supporting Armenia and allocated between €140 and 170 million *via* the Single Support Framework (SSF) for 2014-2017. The focus of the assistance is on private sector development, public administration reform, and justice. In addition, support is being provided for the implementation of EU-Armenia agreements (such as Horizon 2020) and for civil society.

Armenia is also a member of the Organization of the Black Sea Economic Cooperation (BSEC), along with Albania, Bulgaria, Georgia, Greece, Moldova, Romania, the Russian Federation, Serbia, Ukraine and other countries. This organization was founded in 1992, shortly after the disintegration of the USSR, to develop prosperity and security within the region. One of the BSEC's strategic goals is to deepen cooperation with the European Union. Armenia does not have an association agreement with the European Union but is nevertheless eligible to apply for research funding within the European Union's seven-year framework programmes.

The European Union has sought to enhance involvement of countries from the region in these programmes. In cooperation with the BSEC, the European Union's Networking on Science and Technology in the Black Sea Region project (2009-2012) was instrumental in funding a number of cross-border co-operative projects, notably in clean and environmentally sound technologies. BSEC's Third Action Plan on Science and Technology 2014-2018 acknowledges that considerable efforts have been devoted to setting up a Black Sea Research Programme, involving both BSEC and European Union members but also that, "in a period of scarce public funding, the

research projects the Project Development Fund could support will decrease and, as a result, its impact will be limited"¹.

Armenia has been a member of the Eurasian Economic Union since October 2014. This body was founded in May 2014 by Belarus, Kazakhstan and the Russian Federation. As cooperation among the member states in science and technology is already considerable and well-codified in legal texts, the Eurasian Economic Union is presumed to have a limited additional impact on co-operation among public laboratories or academia but it may encourage research links among businesses and scientific mobility, since it includes provision for the free circulation of labour and unified patent regulations.

Armenia hosts a branch of the International Science and Technology Center (ISTC). The ISTC branches are also hosted by other parties in agreement: Belarus, Georgia, Kazakhstan, Kyrgyzstan and Tajikistan. ISTC was established in 1992 by the European Union, Japan, the Russian Federation and the USA to engage weapon-scientists in civilian research projects and to foster technology transfer. The headquarters of the ISTC were relocated to Nazarbayev University in Kazakhstan in June 2014, three years after the Russian Federation announced its withdrawal from the centre.

Armenia is also a member of the Organization for Security and Co-operation in Europe and the World Trade Organization.

Conclusion

Armenia has gained a lot in such a short period of time; nevertheless, there are still many challenges and goals which are to be achieved on domestic, bilateral and multilateral levels.

In this regard we can claim that Science diplomacy and international scientific cooperation are no longer interesting additions or are at the margins of our core policy. On the contrary, they are today a mandatory and critical part of our day-to-day work.

Endnote

¹ Third BSEC Action Plan on Cooperation in Science and Technology 2014-2018. Organization of the Black Sea Economic Cooperation (2014).



Suggestions on enhancing Science and Technology Co-operation between India and Bangladesh



Syed Farid-Uddin Farhad*



Md. Faizal Abedin Khan**

For more than four decades, India and Bangladesh have been cooperating in many fields, including Science and Technology (S&T). The countries are common members of the regional and international organizations such as SAARC, BIMSTEC, IORA, Commonwealth, etc. Both have unique problems of poverty and climate change to name a few, and they share strong cultural ties. In the realm of Science and Technology, Bangladesh and India have recognized the importance of international scientific collaboration quite early and considered it an important tool for the advancement of S&T research. As a result, these two countries have signed a number of collaborative agreements on diverse themes and projects. Some of the examples of such collaborations include agreement signed on cooperation in the field of technological and scientific research for development in 1982 between the Government of People's Republic of Bangladesh and the Government of Republic of India and the protocol signed for scientific and technical cooperation in 1991 between the Science and Technology Division of Bangladesh (STDB) and the Department of Scientific and Industrial Research (DSIR) of India.

In the 4th meeting of India-Bangladesh joint commission on the S&T in 2014, both adopted an agenda under which two workshops were held on chemical meteorology and food safety. A working programme was deployed for S&T cooperation between CSIR, India, and BCSIR, Bangladesh on 15 January 2015 for the period 2014-2017. Lately, the Council of Scientific and Industrial Research (CSIR), India, took the initiative to undertake joint activities to be implemented in the next five year period (2018-2023). Under this new arrangement, both countries would organize seminar, symposium, workshop, short-term training (3/6 month), long-term training (1-2 year) and/or PhD course in the specific fields. The cooperation would include exchange of scientists, researchers

**Senior Scientific Officer, Bangladesh Council of Scientific and Industrial Research, Bangladesh*

***Senior Assistant Chief, Ministry of Science & Technology, Bangladesh*

and scholars in the specific fields and long-term training for young scientists and short-term training for senior and junior scientists.

Considering the above, following potential areas have been identified for further co-operation. They need to be developed further as full-fledged proposals. While we look forward to contribute to them as the participants of the ITEC Programme in Science Diplomacy, these are placed for kind consideration of both the governments.

Material science and advanced organic materials

- Presently, the BCISR Laboratories, Dhaka, have ongoing R&D projects to develop Nano-structured materials for their potential application in Solar energy conversion and storage, gas sensor, photo-catalytic water splitting, water purification, etc. The BCISR scientists are keen to learn cutting-edge technologies in the given field and share research outputs for mutual scientific and technological advancements. India-Bangladesh may collaborate in this area through agreements and joint programmes between the CSIR and other research institutes of India with following institutes and their respective area of research.
 - » Central Glass and Ceramic Research Center(CGCRC): Nano-Structured Materials
 - » National Physical Laboratory(NPL) : Flexible Organic Energy Devices

- » Indian Institute of Chemical Technology(IICT): Solar Energy Research Polymer & Functional materials, Nano-materials Synthesis and Characterization techniques
- » International Advanced Research Center for Powder Metallurgy and New Materials(ARCI): Solar Electrochemical Energy storage(H₂ production), Mesoporous Carbon and Graphene synthesis for consumer electronics; Solar Energy Materials; Sol- Gel Coating and other low cost & industrially scalable synthesis techniques.

After reflecting on the collaborative efforts in the S&T, undertaken by different institutions in Bangladesh and India, it can be inferred that there is an optimism in both the countries, particularly among scientists with interest to encourage mutual sharing of scientific expertise and capabilities.

Various institutional mechanisms and policy interventions may help in further strengthening cooperative endeavors for addressing challenges in agriculture, health-care and biodiversity and environment.

Acknowledgement: The idea of collaborative research projects are taken from the speech delivered by the honorable state minister Mr Yafes Osman, Ministry of Science and Technology, GoB, during his last visit in India (October, 2017). The authors of this article have contributed substantially in preparing the minister's speech.



Science Diplomacy in Action: Highlights of the Indo-Brazilian Agenda in S,T&I



Sec. Luis Fernando Corrêa da Silva Machado*



Sec. Pedro Ivo Ferraz da Silva**

Introduction

India and Brazil are two emerging economies, guided by democratic values and with large population and territories. Both countries share similar challenges and opportunities, which gives room for a wide spectrum of areas of cooperation. In the field of science, technology and innovation (S,T&I), Brazil and India have pursued an agenda through bilateral and inter-regional mechanisms. This agenda has been gradually growing, and at present includes different areas, such as mathematics, biopharmacy, ICT, aerospace, nanotechnology, among others. In spite of the diversity of fields and mechanisms, the Indo-Brazilian cooperation is based on the principle that science and technology constitutes an essential mean for sustainable development in all its forms, social, economic and environmental – of both. This paper intends to highlight some aspects of the Brazilian-Indo relations in S,T&I. In this realm, it would examine not only the major initiatives in the bilateral relation over the last few years, but also the agenda developed in two inter-regional mechanisms of which Brazil and India are members – BRICS (Brazil, Russia, India, China and South Africa) and IBSA (India, Brazil, South Africa Dialogue Forum).

Bilateral Relations in S,T&I

Brazilian-Indo cooperation in the S,T&I started way back to 1985, when a bilateral agreement was signed in science and technology. However, it gained a momentum in 2005, when the India-Brazil Scientific Council (CCBI, in Portuguese) was created. At that time, it was decided that the Council would be co-led by the Brazilian

*Diplomat, Ministry of Foreign Affairs of Brazil, Brazil

**Secretary, Embassy of Brazil in New Delhi, Brazil

National Academy of Sciences (ABC) and the Indian Scientific Advisory Committee to the Prime-Minister (SAC-PM); currently known as the Scientific Advisory Committee to the Cabinet (SAC-C).

Since then, many joint activities have been performed in different areas of research. In 2007, a workshop on the Indian pharmaceutical industry, held at ABC's premises, was led by Prof. S. Sivaram, director of the National Institute of Chemistry of India. He outlined the history, success strategies and prospects of the said industry in the country.

In the same year, a bilateral workshop on molecular materials, including nanomaterials, was held at the National Chemical Laboratory in Pune, India. The Brazilian delegation was headed by a scientist, Fernando Galembeck, who also participated in the 10th International Conference on Advanced Materials.

A year later, the cooperation evolved in other areas such as biomedical sciences, computer engineering, physics and mathematics. A Brazilian delegation, led by a scientist Eloi Garcia, participated in the Indo-Brazilian Meeting on Infectious Diseases, organized by the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) in Bengaluru. Later in the same year, a Brazil-India Workshop on Infectious Diseases was held at ABC's headquarters in Rio de Janeiro, which discussed the situation of AIDS, tuberculosis, malaria and leishmaniasis in both countries.

Also in 2008, an Indo-Brazilian Workshop on Computer Sciences was organized. The event was coordinated by Prof. Virgilio Almeida, University of Minas Gerais (UFMG), and it focused on advanced research topics, especially those of strategic interest to both the countries such as Information and Communication Technologies (ICT) and Cybersecurity. In the same year, the Brazilian scientist, Luiz Davidovich, coordinated the Brazil-India Workshop on Condensed Matter in Rio de Janeiro. The 1st Indo-Brazilian Symposium in Mathematics was held at the Institute of Pure and Applied Mathematics

(IMPA), in Rio de Janeiro, by a Brazilian scientist, Jacob Palis.

In 2010, a bilateral cooperation was reinforced by the "Agreement on Scientific and Technological Cooperation", signed by both Ministries of Science and Technology. The agreement institutionalized the Brazil-India Joint Commission on Scientific and Technological Cooperation, which met in 2012 in New Delhi. The meeting was followed by a joint call in S,T&I (2013), which hosted 14 projects among universities and research institutions from both countries in areas such as ICTs, geosciences, mathematics and renewable energies. In March 2012, the both signed a "Memorandum of Understanding on Cooperation in the Field of Biotechnology", which resulted in two joint calls in biotechnology (2013 and 2015). The calls supported projects in the areas of biopharmacy, biofuels, and neglected and infectious diseases.

Both countries evaluate the possibility of holding, in the first half of 2018, the second bilateral meeting. At the said meeting, it is intended to adopt 2018-2019 Scientific and Technological Cooperation Programme with emphasis in the areas of biotechnology and health, including low-carbon technologies, geosciences, including ocean sciences and climate change, and innovation and entrepreneurship.

Cooperation in the Space Sector

Brazil and India cooperate in Space sector under the "Framework Agreement for Peaceful Uses of Outer Space, 2004"; and two complementary adjustments are for the reception of data from India's remote sensing satellites Resourcesat-1 and 2 (2007 and 2014). These adjustments entail upgradation of Brazilian terrestrial stations in Cuiaba with compatible software and hardware to the said Indian satellites.

Currently, both sides evaluate possibility of cooperating in the SERPENS ("Space System for Research and Experiments with Nanosatellites") programme, organized by the Brazilian Space Agency (AEB). The programme aims at organizing space missions with nanosatellites every two years. The main objective of the project is training of human resource, and the missions

are coordinated by Brazilian federal universities with an aerospace engineering course. Another opportunity for deepening bilateral cooperation would be a possible Indian involvement in the development of the EQUARS (Equatorial Atmosphere Research Satellite).

Possibility of Cooperation in the ICT

Brazil and India have dynamic ICT sectors with a large number and variety of companies, educational entities and research and development centres. Both countries are home to major multinational outsourcing and services companies (TCS, Wipro, Infosys, on the Indian side, Stefanini on the Brazilian side) as well as software houses (Subex, India; Totus, Brazil) and fintechs (Paytm, Indian; Zetrsoft and Digicon-Perto, Brazilian). In the academic sector, the Indian Institutes of Technology (IITs), throughout the Indian territory, and the university centres of Campinas (SP), Vale dos Sinos (RS) and Campina Grande (PB), among others, are known for highly qualified professionals and for the significant scientific production.

The relations between Brazil and India in ICT are centred on reciprocal investments of the private sector. Wipro, with development centre in Curitiba; Infosys, in Belo Horizonte; and TCS, in Tamboré, São Paulo are the main Indian investors in the sector. Stefanini, with centres in Noida and Hyderabad, and Digicon-Perto in Jaipur, are among the top Brazilian companies.

The main joint government initiative in the area of ICT was organization of a bilateral video-conference on global cyber topics in April 2016. At the occasion, possibilities were discussed for cooperation among CERTs (Computer Emergency Response Teams), training programmes and exchange of experiences on regulatory frameworks. Both countries are about to sign a “Memorandum of Understanding on Cooperation in Cybersecurity”.

Besides that a joint agreement between the Itaipu Technology Park Foundation and the Centre for the Development of Advanced Computing of India (C-DAC) is in an advanced stage of negotiation. Once signed, it would

establish cooperation in areas related to high performance computing (HPC).

In view of the diversity of India and Brazil’s achievements in education, research, trade, regulation, incentive policies and social programmes in ICTs, it is assumed that closer approximation would be a welcome for the benefit of the public and private sectors of both the countries.

Inter-regional mechanisms

BRICS

The first formal BRIC (Brazil, Russia, India and China) Foreign Ministers Summit was held in 2008. Since then, the acronym, created a few years earlier by the financial market to identify four emerging economies, became a new political-diplomatic entity. Later on, in 2010, South Africa joined the group. Since its creation, BRICS has expanded its activities in two main areas : (a) coordination in the international meetings and organizations; and (b) construction of a multisectoral cooperation agenda among its members¹.

With 42 percent of world’s population, contributing 18 percent of global GDP, 17 percent of global R&D investment and 27 percent of science papers published on international journals, as an important force of international economic cooperation and one of the most dynamic and promising emerging economies, BRICS countries are major representatives of emerging economies in the world.² The past few years have witnessed a growing commitment of the BRICS countries in developing joint projects, initiatives and networks in Science, Technology and Innovation (STI). In this sense, BRICS cooperation is aimed at complementing and strengthening existing bilateral and multilateral relations among member-countries. Brazil and India, alongside with the other BRICS countries, consider the collaboration in STI a major driving force to societies to overcome internal sustainable development challenges.

Since 2014, there were five meetings of Ministers of STI of the BRICS countries. Yet,

collaboration in the field began as early as 2011, with regular meetings of STI Senior Officials. The following main five thematic areas of cooperation among the countries were set-up in the Memorandum of Understanding on Cooperation in STI: (i) climate change and natural disaster mitigation, led by Brazil; (ii) water resources and pollution treatment, led by Russia; (iii) geospatial technology and its applications, led by India (iv) new and renewable energy and energy efficiency, led by China; and (v) astronomy, led by South Africa.

In the 5th Meeting of the Ministers of STI, which took place in Hangzhou (18/7/2017), the action plan 2015-2018 was updated by identifying activities included in the Action Plan 2017-2018. One of the main concerns that have underpinned the debate of the document was the need of concrete actions, which should emerge from the mechanism. In addition to the five thematic areas of cooperation, the new potential domains included in the updated Action Plan are ³. a) creation of BRICS Young Scientists Forum (India as coordinating country); b) Cooperation on Biotechnology and Biomedicine including Human Health and Neuroscience (Russia and Brazil as coordinating countries); c) Cooperation on Information Technologies and High Performance Computing (China and South Africa as coordinating countries); d) Cooperation on Ocean and Polar Science and Technology (Brazil and Russia as coordinating countries); e) Cooperation on Material science including Nanotechnology (India and Russia as coordinating countries); and f) Cooperation on Photonics (India and Russia as coordinating countries).

The final section of the action plan sets forth the creation of a network of technological parks and incubators for start-ups to create BRICS research and innovation centres. The implementation of the plan would be under the responsibility of the working group of the BRICS Science, Technology, Innovation and Entrepreneurship Partnership (BRICS STIEP). Indian proposal was endorsed during the last meeting of ministers.

Recently, three initiatives stand out within the BRICS cooperation on the STI. The first is the framework programme for funding multilateral joint projects for research, technology commercialization and innovation, launched at the 7th BRICS Summit (Ufa, 2015), which has established joint calls for projects. Eight funding agencies took part into the framework-agreement (for Brazil the National Council for Scientific and Technological Development - CNPQ, and for India the Department of Science and Technology - DST). The pilot-call for projects in 2016 had 26 proposals approved (from 320 proposals submitted in response to the call); of which eight had Brazilian participation and 22 Indian participation (six of them were joint Brazilian-Indo endeavours with other BRICS countries) in projects covering main thematic areas of cooperation. In 2018, the 4th meeting of the BRICS STI Funding Parties would take place in Brazil for final selection of projects to be funded as the outcome of the Second BRICS Coordinated Call for Proposals.

The second initiative is the Young Scientists Forum; its first edition took place in Bengaluru in 2016. The logic that underpins the idea of gathering together young scientists of the BRICS countries lies on the positive impact that this action may have long-term scientific cooperation. The second Young Scientists Forum took place in Hangzhou (2017). South Africa has the intention of holding another edition of the forum in 2018, and Brazil in 2019. This is a remarkable occasion for young Brazilians and Indian scientists to have fruitful interactions and bring about new venues for cooperation.

The third is the creation of a working group on research infrastructures, including mega-science projects, which would promote coordination within large-scale research infrastructure to support initiatives leading to efficient use and development of mega-science projects such as the BRICS Global Research Advanced Infrastructure Network (BRICS GRAIN). The first meeting of the WG took place in Russia in 2017 and the second meeting would take place in Brazil in 2018. When the initiative kicks off, Brazilian scientists

would be able to use Indian large-scale research infrastructures as well as the other way round with positive implications in joint-projects and mega-science projects; carried out by both parties.

Prospects for continuous and enhanced cooperation within BRICS nations are bright and have the potential to unleash other opportunities in the ambit of the Brazilian-Indo cooperation on the STI.

IBSA

It is a unique Forum which brings together India, Brazil and South Africa, three large democracies, and major economies from three different continents, facing similar challenges. All three countries are developing, pluralistic, multi-cultural, multi-ethnic, multi-lingual and multi-religious nations.⁴ The first formal meeting of the Foreign Ministers of the IBSA Dialogue Forum took place in Brasilia in 2003. An IBSA Trilateral MoU on cooperation in the field of the STI was signed during the fourth IBSA Summit, in Brasilia, in 2010.

Since its inception, STI has been identified as one of the key areas for trilateral cooperation. Activities in this area are guided at the Ministerial level through meetings of the S&T Ministers of member -countries (four meetings have been held till now). A Joint Working Group (JWG) was formed to support development of cooperation activities in the STI. To enhance knowledge sharing in the areas of use of IT for development and e-Governance, a Joint Working Group (JWG) on Information Society was created. It was later merged with JWG on Science and Technology. During various Information Society JWG meetings, synergy in the areas of e-Governance, capacity-building, local content development and e-health was sought to be established. The issues discussed by JWG were: a) e-Readiness Indicators and Assessment Methodology for the IBSA Countries; b) e-Governance Standards and Data Quality Management; c) Free and Open Source Software (FOSS).

The main thematic areas of research cooperation on STI are: a) biotechnology b) nanotechnology c) Health Sciences (HIV/AIDS, malaria, tuberculosis

d) Indigenous Knowledge e) Alternative and Renewable Energy f) Oceanography and Antarctic research and g) Information and Communication Technologies. Activities in each area are implemented by area coordinators, who are experts in their respective disciplines.

In support of the activities in these sectors, the three countries created a seed fund of USD 1 million in each country for collaborative activities,⁵ in which seven proposals were approved – three in the field of HIV/AIDS, two in nanotechnology and one in oceanography and another in biotechnology.

Despite the fact that some analysts point out that the cooperation within IBSA has waned in the past few years (Woolfrey, 2013), overall IBSA Forum has been quite successful in promoting IBSA cooperation within multilateral fora and advancing some concrete projects in the area of the STI. The cooperation within IBSA may pave the way for mutual knowledge and sharing of experiences that had strengthened bilateral cooperation between the two.

Closing Remarks

In 2018, Brazil and India are celebrating 70 years of establishment of diplomatic relations. Throughout these years, the two countries have succeeded in bringing out robust national systems of science, technology and innovation, and both countries stand out in international indexes on numbers of science papers published on international journals. Despite several initiatives that have already been jointly put in place by both nations, the signatures of international instruments that enable the cooperation in the sector and the creation of a bilateral commission to evaluate the pace of the cooperation on S,T&I, there is still room for improvement and for further action. The recent establishment of an specific mechanisms on S,T&I within inter-regional mechanisms has pushed even further the bilateral agenda fostering contacts and interactions among scientific communities of Brazil and India, which would certainly bear fruit in the forthcoming years.

Endnotes

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EU Science Diplomacy as a Bridge between EU and non- EU states: A Case Study of Croatia-Serbia-Belarus



Ana Basic*



Anastasiya Liaschhenia**



Aleksandar Fistes***

Introduction

Lately, the world faces many problems. Actions on them require their deep understanding and all together can generate possible solutions. Diplomacy is guided by overarching goal of using science to build bridges between countries and to promote scientific cooperation as an essential element of foreign policy. The main purpose of such support actions is awareness-building and capacity-building in both S&T and diplomatic communities. Following this, scientific cooperation has an indisputable role in effective European neighbourhood policy, international relations and development policy.

The overall aim of this paper is to present EU Science Diplomacy and one of its main tools programme - Horizon 2020 as a bridge between EU member countries as Croatia and non-EU countries like Serbia and Belarus. An overview of the concept and relevant tools and practices in these three countries has been presented.

The Republic of Croatia is situated at the crossroads of Central and Southeast Europe on the Adriatic Sea. Croatia became the 28th member state of the European Union on 1 July 2013. A country of 4.4 million people, Croatia ranks 45th, out of 188 countries in the UNDP's Human Development Index.¹

The Republic of Belarus is a landlocked country in the Eastern Europe, bordered by Russia to the northeast, Ukraine to the south, Poland to the west, and Lithuania and Latvia to the northwest. The total population of Belarus is around 9,5 million people.² Its

* Adviser in Minister's Office, Ministry of Economy Entrepreneurship and Crafts, Croatia

** Consultant, Ministry of Economy, Belarus

***Associate Professor, Faculty of Technology, University of Novi Sad, Serbia

capital and most populous city is Minsk. Belarus ranks 52th, out of 188 countries in the UNDP's Human Development Index.

The Republic of Serbia is located in the south-east region of Europe and has a land area of 88,361 sq km. The total population of Serbia is around 8 million people with the Belgrade as a capital city. Its nominal GDP in 2016 amounted \$37.745 billion, which is \$5,376 per capita.³ Belarus ranks 66th, out of 188 countries in the UNDP's Human Development Index. It holds the position of military neutrality, and on 21 January 2014, the 1st Intergovernmental Conference took place, signaling formal start of Serbia's accession negotiations.

EU Science Diplomacy

Globally Science Diplomacy is becoming a crucial issue at the time of major crises, but it is still scarcely known and perhaps not optimally used. Europe, in particular the EU, has a high level of scientific excellence and should, therefore, be able to mobilise its scientific potential as a main mean of action within its foreign policies.⁴ A commissioner for research, science, and innovation, Mr Carlos Moedas stated that "he wants to see the EU play an increasingly active and visible role in international science diplomacy. This can be achieved, namely, by using the universal language of science to maintain open channels of communication in the absence of other viable foreign policy approaches, ensuring the EU maintains its presence at the highest level of international scientific endeavor, and ensuring the EU has access to research performed outside Europe".⁵

Science Diplomacy and science and technology are very high on the list of priorities of the EU. Furthermore, EU's competence in science diplomacy is embedded in how S&T policy is dealt with in the European treaties. There is no genuine legal competence for a single European S&T policy, as under article 4(3) TFEU, research and technological development are seen as shared competence in which the EU can carry out activities, but member states can also exercise competences in parallel. By virtue of Article 181

TFEU, member states and the EU must, therefore, coordinate their policies to ensure a coherent research policy. Article 180(b) TFEU states that "the EU will carry out the promotion of S&T with third countries while complementing that of the member states". As such, it can be said that the EU's science diplomacy has to be seen as a shared responsibility.

In 2008, the European Commission adopted a 'Strategic European Framework for International Science and Technology Cooperation'⁶ and established a European 'Strategic Forum for International S&T Cooperation' (SFIC) with the objective "to facilitate (...) the international dimension of ERA". The importance of international cooperation in S&T is explicitly recognised in Horizon 2020. In the 2012 Communication of the E C, entitled 'Enhancing and focusing EU international cooperation in research and innovation: a strategic approach'⁷, following three core objectives for international cooperation with non-member states are outlined.

- Strengthening the Union's excellence and attractiveness in research and innovation as well as its economic and industrial competitiveness;
- Tackling global societal challenges; and
- Supporting the Union's external policies.

The communication also states that cooperation in research and innovation will make use of Science Diplomacy to achieve soft power and improve relations with third countries. In the document COM (2012) 497, it is clearly stated that such an international cooperation should support the EU's external policies by coordinating closely with enlargement, neighbourhood, trade and its Common Foreign and Security Policy (CFPS). The same document also mentions that science diplomacy has to be used as an instrument of soft power "and as a mechanism for improving relations with key countries and regions".

A similar point of view is expressed in COM (2014) 339 Final⁸, where it is stressed that further efforts need to be made in addressing the external dimension of Research and Innovation policy. The literature review and internet search revealed that it is not easy to find strategic documents at

the level of EU member states with regard to Science Diplomacy. There exist many different operational tools across different EU member states, which put Science Diplomacy in action. However, in most cases we are dealing with implicit form of Science Diplomacy as the concept is not always mentioned. Furthermore, in line with the observed absence of strategic tools, the operational tools are not always clearly linked to Foreign Affairs policies. From the review of national Science Diplomacy initiatives, it can thus be concluded that most EU member states do not have a Science Diplomacy strategy. In most cases, however, member- states are engaged in some activities that can be labelled as Science Diplomacy. But the national efforts in most cases remain very limited and there are little support structures. On top of it, most national Science Diplomacy activities are at best only loosely connected to Foreign Affairs policies. In other words, Science Diplomacy is not well developed within most of the EU member states.

One proposal of the Logenhove ⁴ is to focus EU Science Diplomacy Strategy upon three areas, which are a mix of self-interests and aspirations to have a positive impact on the world. These are: (i) Science and technology towards enhancing regional security in its neighbourhood, (ii) Science and technology improving European trade in the world and (iii) Science and Technology resolving global problems.

Strengthening of the EU's global position in research, innovation and technology is passing through proactive international cooperation. It specifically aims at developing a common 'Knowledge and Innovation Space' in the EU Neighbourhood, and is developing Science and Technology agreements with some more strategic partners (Australia, Brazil, Canada, Chile, China, Korea, India, Mexico, New Zealand, Russia, South Africa, USA,..). But there are also Policy dialogue and platforms on the STI cooperation at the regional level (Africa, ASEAN, Central Asia, Gulf, LAC, Pacific). As commissioner Moedes stated⁵: "I am always on the lookout for new opportunities to further EU science diplomacy, with the purpose of ensuring that European values lead global scientific endeavor. The EU's

Horizon 2020 funding, for example, has been open to the world from the start, but my department and I pushed in 2015 to include the Ukraine and Tunisia associations in 2015, because we believe participation in EU programmes will encourage both countries to invest in their scientific communities, better positioning them to recover from conflict as well as to contribute diversity to future EU projects"

Science Diplomacy of EU is built on Horizon 2020, which is an impressive research innovation programme worth €80 billion over 2014-2020. It induces a significant external dimension. By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. With a view to support implementation of reforms, one of the instruments that European Union uses to strengthen cooperation between EU member-countries on one side and the potential and candidate countries on another in the area of European policies for a specified period of time. Participation in EU Programmes for candidate states represents an opportunity to make acquaintance with the European institutions, legislations and their application in practice with EU policies as well as with the system of values and mechanisms on which the EU is based.⁹

The goal is to ensure Europe producing world-class science, removing barriers to innovations and making it easier for the public and private sectors to work together in delivering innovation. Horizon 2020 is open to everyone with a simple structure that reduces red tape and time so participants can focus on what really is important.

Furthermore, the EU Framework Programme for Research and Innovation would be complemented by further measures to complete and further develop the European Research Area. These measures would aim at breaking down barriers to create a genuine single market for knowledge, research and innovation.

On 11 January 2018, the Commission adopted a Communication on the interim evaluation of Horizon 2020, which outlines its views on how the impact of a successor research and innovation investment programme could be maximised.

In the first three years of the programme implementation, EUR 20.4 billion—just about one fourth of the total Horizon 2020 budget — were allocated to 11,108 signed grants. Horizon 2020 has, so far, attracted more than 100,000 applications, representing a 65 percent increase in the annual number of applications compared to the earlier year, the 7th Framework Programme (FP7). It involves top level participants from the higher education, research, private sectors and from a wide range of disciplines and thematic fields. The main beneficiaries of Horizon 2020 are higher education and research organisations, which together received 64.9 percent of the funding, the private sector received 27.7 percent, and public authorities and other types of organisations 7.3 percent. About 23.9 percent of the budget for industrial and enabling technologies and societal challenges was given to SMEs, exceeding the legal target (20 percent). More than half (52 percent) of participants were newcomers. Participants came from over 130 countries (including 87 third countries). Those from EU-28 countries received 92.9 percent of the funding. Approximately 75 percent of all funding, so far, was used for instruments, supporting collaborative research and innovation, while the rest was for individual beneficiaries to support excellent science through European Research Council grants and research and innovation projects for the SMEs. Further strengthening the EU's science base is as necessary as ever, and remains a valid Horizon 2020 objective. The societal challenges identified when conceiving Horizon 2020 still exist, and are valid continued priorities for the EU and Horizon 2020. The relevance of Horizon 2020 also lies in its contribution to the achievement of a wide range of EU and global objectives such as the Sustainable Development Goals. Horizon 2020 has been flexible enough to support research on urgent new fields (e.g. Ebola and Zika outbreaks, migration) as well as new, promising science and research.¹⁰

The strategic programming process improved intelligence-base underpinning programming choices, though stakeholders call for even greater transparency. The high application rate, including from newcomers, also shows the relevance and attractiveness

of Horizon 2020 for stakeholders. The annual number of applications have increased by 65 percent between FP7 and Horizon 2020, including 78 percent from new applicants, mainly from the private sector. Stakeholders' substantial reasons for participating in particular getting financial support, access to knowledge and expertise, and collaboration with European or international partners — illustrate importance and relevance of Horizon 2020.¹⁰

Science Diplomacy of Croatia

There exist many different operational tools across different EU member states that put Science Diplomacy in action. However, in most cases we are dealing with implicit form of Science Diplomacy as the concept is not always mentioned. Furthermore, in line with the observed absence of strategic tools, the operational tools are not always clearly linked to Foreign Affairs policies as an example in Croatia.

There existed great bilateral agreements among countries dealing with one or another form of international S&T cooperation, but none of them were referred to term science diplomacy. As stated earlier, Croatia has many bilateral agreements with EU countries on S&T cooperation like with Austria, Italy, Germany, France and non-EU countries USA, Israel, Russia, China, Japan. Cooperation with a number of countries and foreign partners with which the Government of the Republic of Croatia, i.e. the Ministry of Science and Education has not concluded international legal acts, is realized exclusively on the basis of direct inter-institutional agreements. In the light of globalization processes, the practice of concluding agreements on the governmental level is being abandoned; therefore, mostly highly developed countries support direct cooperation of institutions in the sphere of education, higher education, science and technology.

It is undisputable that numerous basic researches can improve competitive advantages of Croatian economy and Croatian companies. Scientific research in Croatia is monitored and conducted in six fields of science : natural sciences, technical, biomedical, biotechnical and social sciences and humanities.

One of the strategic documents on S&T is the Strategy for Innovation Encouragement of Croatia 2014-2020 adopted in December 2014. Its main objective is to increase level of competitiveness of the Croatian economy and increase social well-being. The document entails a list of around 40 guidelines structured around following four thematic pillars:

- Development of the innovation system and setting up a legal and fiscal framework to encourage innovation;
- Strengthening innovation potential of the economy;
- Encouraging cooperation and knowledge flow among businesses and academia;
- Strengthening of the human resources in innovation and creation of an attractive environment for world-class researchers¹¹.

The second strategic document “Strategy for Smart Specialisation (S3)” is focused on the following thematic areas:— health and quality of life, energy and sustainable environment, transport and mobility, security, food and bio-economy. The S3s Action Plans for 2016 and 2017 envisage a series of actions such as mapping of R&I capacities in research and business sectors, establishment of Innovation Network for Industry, thematic innovation councils, thematic innovation platforms, centres of competence, etc. The National Innovation Council and Interministerial working group are foreseen to manage S3 and to establish a system of evaluation and monitoring. The adoption of the S3 has opened possibility to tap into European structural and investment funds ESIF 2014-2020.¹²

Following the above mentioned documents, the governance of R&I system in Croatia is centralised at the state level (weak regional dimension). R&D policy falls mainly within the scope of the Ministry of Science and Education with innovation aspects dealt by the Ministry of Economy, Entrepreneurship and Crafts. The afore mentioned bodies together with the Ministry of Regional Development and European Funds acquire increasingly important role because of the growing role of the European Structural and Investment Funds for financing R&I activities.

The main funding body for competitive research projects is the Croatian Science Foundation, responsible for improving competitiveness, visibility and integration of the Croatian research area into European Research Area (ERA). The highest advisory body for the research, higher education and technology is the National Council for Science, Higher Education and Technological Development. The Agency for Science and Higher Education is responsible for setting up a national network for quality assurance and evaluation of scientific research and higher education.

The Croatian Agency for Small Business, Innovation and Investment (HAMAGBICRO) is responsible for implementation of all business R&I related ESIF. There are 184 scientific organisations registered in Croatia for scientific activity, and recorded in the Register of scientific organisations. These include 25 public research institutes and 91 higher education institutions. Besides, there are several research institutes in state ownership oriented to market research. There are around 25 private research organisations which are either independent institutes (e.g. the Mediterranean Institute for Life Sciences) or belong to corporations (e.g. Ericsson Nikola Tesla). Several small research-based companies have been founded over the last years; some are not present in the Register of research organisations.

There are several research and technology institutions with the main mission of fostering science-industry cooperation and commercialisation of research results such as the Science and Technology Parks. Important measures for improvement of the national innovation system include, among others, further strengthening of technology transfer offices at universities, establishment of Innovation Network for industry, creation of thematic innovation platforms and centres of competence. Establishment of thematic innovation platform, related to Smart Specialisation Strategy 3 (S3), priorities has also been envisaged. This should be initiated within the strategic project for supporting establishment of innovation network for industry and thematic innovation platforms, which was started in May 2016, and is expected to

last for four years, together with the establishment of the Innovation Council for Industry and eight thematic innovation councils (linked to the thematic and crosscutting themes of S3). Based on the proposal of the National Council for Science, Higher Education and Technology Development, MSE established thirteen centres of research excellence in 2014 and 2015. The best researchers are selected in the particular (sub-)fields of science and it is the main supporting measure aiming at increasing internationalisation of companies, primarily SMEs, including several grant schemes, which are to be funded by ESIF within the Operational Programme Competitiveness and Cohesion 2014-2020.¹³

Croatia participates in many programmes of EU in the area of S&T, like COST model, European Commission Framework Programme (FP) for research and technology development, European Structural and Investment Funds and Horizon 2020, and also the Competitiveness of Enterprises and Small and Medium-sized Enterprises COSME (Erasmus+, Creative Europe, European Union) Programme. For this paper, focus is on Horizon 2020. Croatia has set up the necessary administrative and institutional framework for FP/H2020, which consists of the National Contact Points and members on Horizon 2020 programme committees. The national portal for H 2020 programme was launched in December 2013. Some data was published in September 2017 on the participation and results of Croatian institutions participating in the Horizon 2020 programme in accordance with the official data published on the eCORDA (External Common Research Data Warehouse) platform. The total amount of financial resources allocated to participants from the Republic of Croatia was € 42.204.486,00 and the total number of project proposals (proposals) was 1882 and projects funded were 209, and the total number of participating Croatian organizations was 2433.¹⁴

Regarding the science in the service of Foreign Affairs, like S&T advisors attached to embassies, this is not practice in Croatias diplomatic norms. In most emabssies, the advisors for economy are in-charge for area of S&T. But, regarding bilateral agreements of Croatia on S&T with other countries,

Ministry of Foreign and European Affairs as a main institution for international cooperation is in charge for this process in coordination with Ministry of Science and Education, Ministry of Economy and other relevant institutions. So the conclusion in this case is that we can see excellent examples of science diplomacy in Croatia, but are not referred like that.

Science Diplomacy of Serbia

Since 2000, Serbian budget allocations for science have had a significant growth in gross amount, from the modest sum of EUR 28 million in 2001, to about € 100 million in 2008. Still, the share of science in GDP in 2003 amounted to 0.3 percent, and continues to stagnate at that level right till late. In addition to the budget funds of the Ministry of Science and Technological Development, there are also other sources of investment in science in Serbia such as other ministries and public administration authorities, including Autonomous Province of Vojvodina. Institutes generate income through cooperation with the industrial sector and take part in international programmes. The estimates being that the income of the institutes and higher education together with budget financing make a total of approximately 1.3 percent of the GDP. Since 2007, science and research is the area in which Serbia is a member already of European Union. Serbia is associated with the Seventh EU Research Framework Programme (FP7) since January 2007. The Ministry in charge of Education, Science and Technological Development is in charge for this programme in Serbia. The International Agreement for the Horizon 2020 was signed on 1 July 2014. Currently, its researchers are participating in Horizon 2020 actions.¹⁵ Eight chapters out of 35 are opened within negotiation process with EU, and one of the first chapters that was provisionally closed is Chapter 25, Science and Research. Although the Science Diplomacy can be considered as something new for Serbia, but the actual synergy between diplomacy and science brought the results. Diplomacy opened the door for science and science took the chance that it was offered.

On the proposal of the Ministry of Education, Science and Technological Development, the Government of the Republic of Serbia adopted the Strategy for Scientific and Technological Development of the Republic of Serbia for the period 2016 to 2020 - "Research for Innovation". The strategy has set goals in the field of science and innovation in the Republic of Serbia until 2020 as well as instruments and guidelines for their realization. The vision of the Strategy is that in five years, science in the Republic of Serbia would be based on a system that supports excellence in science and relevance for economic development, competitiveness of the economy in the Republic of Serbia, and the development of the society as a whole. The mission of the Strategy is to establish an effective national research and innovation system integrated into the European Research Area, which relies on partnerships in the country and abroad, and would contribute to economic growth, social and cultural progress, raising citizens' standards and quality of life.¹⁶

Serbia embraced the so-called "innovation imperative", that is the notion that successful participation in the global knowledge economy requires ability to adapt and advance new technological and research capabilities, involving public and private collaborations. Innovation Fund, established in 2011, aims to promote linkages between research and technology development and economy, and encourage and support the development of innovative technologies. The EU's support for the Innovation Fund has been instrumental in advancing Serbia's innovation financing and promoting better integration between the research and private sector. The Fund is thus an important step towards closer links between Serbia's and EU's research communities and innovation ecosystems. Between 2011 and 2016, the Innovation Fund implemented the Innovation Serbia Project with the primary goal of piloting financial instruments supporting early-stage innovation activities and stimulating research and development (R&D) with commercial potential in private enterprises of Serbia. This Project was funded by the 2011 EU Instrument for Pre-accession Assistance (IPA), and administered by the World Bank.

A total of 33 national patent applications as well as 25 international patent applications (13 PCT, 4 EPO, 1 US, 1 Australia, Eurasia and Japan) were filed by Innovation Fund's beneficiaries. In 2016, the Innovation Fund launched two new programmes – the pilot activity for the promotion of technology transfer from academic to commercial sector – the TTF Programme and a novel financial aid instrument for financing innovative projects with potential for commercialization, resulting from cooperation between public R&D organizations and private SMEs – the Collaborative Grant Scheme for R&D Organizations and Private Sector Enterprises. In 2017, the Innovation Fund launched so called Mini Grants and Matching Grants programmes aimed at private micro and small enterprises.¹⁷ Previously mentioned facts clearly indicate that the Fund is an important step towards closer links between Serbia's and EU's research communities and innovation ecosystems.

Beside Horizon 2020, cooperation within the EU framework offers a wide variety of other programmes such as: Creative Europe (European Commission's framework programme for support to the culture and audiovisual sectors), Erasmus + (EU exchange student programme), the Marie Skłodowska-Curie actions – MSCA (support research training and career development focused on innovation skills), COST action (European cooperation in the field of scientific and technical research), Eureka (European network developing cooperation between SMEs, research centres and universities for industrial innovation 2014-2020), etc.

Besides that the Republic of Serbia runs bilateral cooperation programmes with a number of countries (Belarus, China, Croatia, France, Germany, Hungary, Slovakia, Slovenia, Montenegro, Italy, Portugal, Austria). This has resulted in co-financing of R&D projects; carried out by teams consisting of researchers from partner countries. Cooperation agreements are underway with Czech Republic, Greece, India, Russia, Spain and US.¹⁸

Multilateral cooperation takes place through the Central European Initiative (CEI), Scientific

and Technological Cooperation in the Danube Region, NATO science for peace and security (SPS) and the Organization for Black Sea Economic Cooperation (BSEC) [18].

Science Diplomacy of Belarus

Belarus is a small country with open economy. Its major economic sectors are service agriculture, industries and manufacturing. The country participated in around 3900 international agreements including over 2200 bilateral and around 1700 multilateral.¹⁹

Following the principle “we cooperate with those who are willing to cooperate with us”, Belarus has got over 45 bi- and multilateral agreements on the governmental level on cooperation in S&T or more widely, on economic collaboration, while S&T is the integral part thereof; covering almost half of the EU member- states (Bulgaria, Cyprus, Czech Republic, Denmark, Germany, Hungary, Italy, Latvia, Lithuania, Poland, Slovakia, Romania, and also UK), as well as Macedonia and Serbia in the Balkans. In the Mediterranean, the agreements have concluded with Turkey, Israel, Egypt, Libya and Syria. Belarus also has got a legal basis for cooperation with China, India, Vietnam, Indonesia, Iran, Qatar, Kuwait, United Arab Emirates, South Africa, Venezuela as well as with industrialised countries like Japan, South Korea and United States.²⁰

Within the EU, Germany, France and UK are among the top partners, followed by Austria, Italy, the Netherlands, Poland and Switzerland.

The number of agreements and direct contracts at the institutional level in Belarus are hard to estimate; as there is no source for such kind of information, while appropriations may give wrong results due to different levels of international activity of institutions. Annually, approximately 450 international S&T projects are being implemented in Belarus.

Part of these projects are being implemented through bi-annual programmes within the framework of bi-lateral cooperation agreements in science and technology between Belarus and the partner. Usually, each party funds its

own participants. Belarusian partners of these programmes are funded by *the State Committee for Science and Technology and/or Belarusian Republican Foundation for Fundamental Research*. Traditionally, joint R&D projects as well as organization of joint scientific events are supported.

To support bi-lateral S&T cooperation with the neighbouring countries (Russia, Latvia) and strategic partners (China, South Korea, Kazakhstan, Venezuela), several bi-lateral centres have been set up. Most of them are hosted by the Scientific and Technological Park “Polytechnik” at Belarusian National Technical University. Belarus – South Korea centre is located in the National Academy of Sciences.

The International S&T cooperation, and the implementation of bi- and multilateral S&T projects, in particular, is supported by the Government of Belarus: annually, 3-4 percent of the total expenditure for R&D is for this. The financial profit is evident: on an average, the foreign sources give 5-7 percent of the total R&D funding in the country. Due to the strong pressure on research teams to commercialize the results of their R&D activities and increase international collaboration on the one hand and decrease of the national sources of financing on the other, the share of foreign sources in the total expenditures for R&D has reached 13.8 percent.

Within the Eastern Europe and Central Asia region, Belarus is a member of 2 alliances – Commonwealth of Independent States (CIS) and European-Asian Economic Cooperation (EurAsEC). At the moment, collaboration seems to be more alive within EurAsEC, which managed to launch the first S&T programme “Innovative Biotechnologies”, initiated by Belarus.²⁰

In recent years, relations between the European Union and Belarus have gone through a number of stages. Over the past two years, however, there has been progress in EU-Belarus relations. Belarus has been participating more pro-actively in the Eastern Partnership, in particular, in multilateral formats; negotiations on a Mobility Partnership were concluded and negotiations on a Visa Facilitation and Readmission Agreements are underway. Tangible steps taken by Belarus

to respect universal freedom, the rule of law, and human rights, including fundamental labour rights, would remain fundamental criteria for shaping of the EU's future policy towards Belarus, as was stated in the Foreign Affairs Council Conclusions of 15 February 2016.²¹

On the initiative of Belarus, the annual EU-Belarus Human Rights Dialogue was resumed in July 2015. The most recent Dialogue was held in July 2017. On 22 August 2015, the remaining political prisoners were released from Belarusian jails. The EU welcomed this long-sought step, which represents an important milestone in relations between the EU and Belarus. The EU lifted most of the restrictive measures in February 2016, also activated a key package of economic and other cooperation-related measures. The package includes cooperation with international financial institutions such as the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD), enhanced preparations for World Trade Organisation (WTO) accession, and removal of textile quota for exports. The remaining restrictive measures (the arms embargo and the restrictive measures against the four individuals listed in connection with unresolved disappearances) are currently in place until 28 February 2018. All decisions, regarding EU restrictive measures, require unanimity among 28 EU member -states.

Belarus is one of the strongest-performing Eastern Partnership countries in the Horizon 2020 programme for research and innovation. In September 2017, the conference "From innovative ideas to successful businesses: promoting national systems of early stage financing of innovative companies in EaP countries" was held in Minsk. In the 2018-2020 Work Programme for Horizon 2020, for which almost €200 million have been allocated to a series of calls focusing on energy and resource efficiency in the process industry ("SPIRE") with a particular geographical focus on the Eastern Partnership countries.

Under Horizon 2020, more than €12 million were allocated to Belarus for different projects for the period 2002-2017. As a result ,Belarusian scientists took part in 113 projects, which aimed,

among others, in strengthening of the Scientific and Technological cooperation between the EU member-states (and Associated Countries) and the Eastern European and Central Asian; bridging the gap between research and innovation, exchanges of technological innovations and practices, strengthening links and boost cooperation among the Information and Communications Technology research and industrial communities, etc.²²

Besides, Horizon 2020, Belarus cooperates within the EU within a wide variety of other programmes such as Erasmus + (EU exchange student programme), MOST (Mobility Scheme for Targeted People-to-People-Contacts, project offering short-term mobility and cultural exchanges for professionals), the EU4Youth (programme benefit young Belarusians through its support to skills development, creativity and entrepreneurship, as well as capacity building for youth organisations), the Strengthening Private Initiative Growth in Belarus (SPRING) (programme backs private local economic initiatives in order to develop the private sector, increase job creation, and promote economic growth in Belarus), the Eastern Europe Energy Efficiency and Environment Partnership (E5P) (this Trust Fund, managed by the EBRD, supports loans for municipal sector projects across the Eastern Partnership countries on energy efficiency and the environment) etc.

Conclusion

We conclude by pointing out that one of the challenges in defining an EU Science Diplomacy is the relation between what is done at the level of member states and what can be done at the EU level. Some member states already have some own science diplomacy policy and tools available and some of them, like Croatia, have it in practice not in term like science diplomacy. The EU would need to focus on areas that are a mix of self-interests and aspirations to have a positive impact towards enhancing regional security in its neighbourhood.

EU's Science Diplomacy activities should focus on the European eastern and southern surrounding regions. Here Science Diplomacy

could serve as a bridge to build and strengthen relations and trust among the EU and its regional neighbourhoods by connecting their scientific communities better to the world of science and technology on the EU level as well as on the global level.

It is clear that neither trade and economics nor regional security can be the only concern in the EU's relationships with non-EU states like in the case studies of Serbia and Belarus. For them participation in EU Programmes, such as Horizon 2020, represents an opportunity to make acquaintance with the European institutions, legislation and their application in practice with EU policies as well as with the system of values and mechanisms on which the EU is based.

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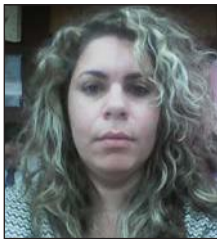
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22. Bilateral cooperation <http://mfa.gov.by/bilateral/>



Global Health Diplomacy: Union Bridge Between Health Policy and International Relations in the Twenty-First Century Cuba As A Case Study



Danev Ricardo Perez Valerino*



Grelia W. Lopez Alvarez**

Introduction

The globalization process, characterized by the steady growth with significant impact on the global population, has been modified continuously by technological, political and economic changes, which govern “global village” in which we are living, affecting manifestly relationships established by the states. The settings in the last two decades of a political system, which modified global trade among states and determined other aspects of human development, influenced directly complex relationship between global health and international relations, especially the field of international cooperation in health (Kickbusch *et al.*, 2007). This scenario has created new global international actors with different roles and responsibilities as well as new alliances and partnerships; assuming a leading role in human community.

Generally, the policy in the external field has been focused on the protection of national interests from the point of view of security, economic and territorial development, and ideological interests. This vision has evolved for seeking to include in discussion circles and meetings of high political level, the high degree of importance to human health.¹

In the recent years, health policies have had a greater presence and priority on the international agenda.² This raises challenges for countries and international organizations to impose an exponentially greater dialogue among the fields of health and international relations.

* Head of International Relations, Finlay Vaccine Institute, Cuba

**Officer, Ministry of Science Technology and Environment CITMA ,Cuba

Through this we will show and characterize briefly an interesting work tool implemented by governments and other actors of the international politics during the last ten years to achieve increasing attention on global health from a perspective supported by collaboration, solidarity and comprehensive development among countries and international institutions.

Background

Historically, the fields of health and international relations, although not complete strangers, have not had a relationship to consider health as a prominent topic by foreign ministries; instead they considered this a matter of low priority. In this sense, the trend generally, has always been considered of “high politics” to matters of war and peace, economics and trade. However, it should be noted that ancient health and disease (as a result and as a weapon) was a matter of high importance in the wars, particularly in the great wars of the nineteenth and twentieth century.³



Source: International Conference at Alma-Ata (USSR) in September 1978. A view from the stage at Alma-Ata. *Source:* http://www.paho.org/english/dd/pin/alma_photos.htm

From the perspective of policy on health, several observers indicated that international trade and finance, population mobility, environmental change, international conflicts and disasters as well as issues of international security, among others factors, impacted health. Stronger links have been between health and foreign policy in

the fields of transportation, commerce, tourism and emigration,⁴

For example, in the nineteenth century various forms of international cooperation were generated in health due to the spread of infectious diseases, which impacted negatively on trade among countries; this gave greater importance to the health of the ports. From there it became necessary to regulate this situation, and in 1832, International Health Regulations were created .

Since 1945, after the establishment of the United Nations, reconstruction of post-war economies and increasing liberalization of trade led to the creation of numerous international agreements and institutional arrangements relating to health.⁵ Among them, in 1978 mention may be made, of the Alma Ata’s Declaration on Primary Health Care, the significant attention given to the issue of HIV/AIDS in global or regional Heads of States such as the Declaration of Nassau, where Caribbean Community (CARICOM)’s heads of states recognized health of the population as part of the wealth of this geographic region, and also during 2007 Trinidad and Tobago’s Summit, when the situation of chronic not communicable diseases was widely discussed. An example of convergence of trade and health interests in 2002 and 2003 with the outbreak of Severe Respiratory Distress Syndrome (SARS) affecting the Asian region was also observed.

However, it should be noted that after the aforementioned Declaration of Alma Ata, the global health agenda was driven mainly by the appearance of diseases with the emergence of the term of health security. Even though the nations agreed to the provision of basic health needs with a model called “Primary Health Care”, the language used in the Declaration consisted of an ambiguous interpretation; facilitating many governments for assuming no real commitment. Besides there were health programmes, which they did not consider key elements, such as community involvement and recognition of health promoter.

Global Health Diplomacy, Branch of Science Diplomacy: Highlights

Since 2005, WHO has been at the centre of the new relationship between health and foreign policy, as a result of the negotiations for the formulation and enactment of the Framework Convention for the Control of Snuff, the new International Health Regulations and related to the Global Strategy and Plan of Action on Public Health, Innovation and Intellectual Property held in 2008.⁶

Another point to note in this transformation was the launch of the Initiative on Global Health and Foreign Policy (GHFP), signed in March 2007, as Oslo Declaration in the Norway's capital by the Ministers of Foreign Affairs of Brazil, France, Indonesia, Norway, Senegal, South Africa and Thailand to move towards a foreign policy taking into account considerations beyond global crises and health emergencies. This initiative sought promotion of use of health lens in the formulation of foreign policy to work together towards common goals. The Oslo Declaration and 2007 Agenda for Action noted the urgency of extending the field of foreign policy to encompass priority health issues in the era of globalization and interdependence, and referred that this new vision was based for protecting life of world citizens

This positive change in the nature and perspective of the relationship between health policy and foreign policy is a challenge as well as an opportunity for countries and organizations in terms of international cooperation. In this globalized world, every country and sub-region has significant number of problems, challenges, opportunities and commitments, which match conditions of the interdependence between health and foreign affairs policies, and displayed more clearly need to capitalize on global health opportunities for the benefit of their people, to realize the rights and aspirations of their citizens and to assumed commitments presently around the world. That's why it's essential to attract national and institutional capacities to ensure effective management of these opportunities and to address associated risks and threats to health.

Following these premises, a technical and academic programme was configured, known by some specialists as Global Health Diplomacy or GHD (Kickbusch *et al.*, 2007). In that way, several academic institutions and think-tanks have begun, as an outcome of the Oslo Declaration, to play a critical role aiming to raise profile of health as a topic of concern for foreign policy, carrying the banner of need for providing policy analysis and research, while improving training opportunities for both diplomats and specialists in public health at the interface between health and foreign policy.

Academic programmes following this line have been implemented primarily at the Center for Strategic and International Studies, based in Washington, through the Global Health Policy Center, Institute for Global Health of Beijing; Center for Global Health Security Chatham House in London; Fiocruz Institute of Brazil through the Institute for Global Health, and the Graduate Institute of International Studies in Geneva, Switzerland.

Several studies conducted in most of these institutions were published regarding relationship between Health's Governance and Health System's Development Process⁷ in the nations, which required to analyze changes that occurred in the architecture of international health cooperation in the recent years, which undoubtedly represented a different and innovative behaviour according to what had happened in the field of international health after World War II.

Some of the notable changes included are as follows:

- The proliferation of new transnational actors and private actors in the corporate business sector, including commercial profit companies, the philanthropic sector and business associations and non-governmental development organizations in developed countries;
- The growing role of international financial institutions in the financing and governance of the health sector in countries of low and middle income;

- A progressive interference in the private sector in the development of public policies, particularly developed countries private agents influencing public policy in developing countries.

Dr Ilona Kirksbush, General Director of the GHD Programme, at the Institute of Graduate International Studies in Geneva, Switzerland, stated that GHD tried to relate the negotiation process in which multiple actors were involved to varying degrees of political and economic relevance, and shaping and coordinating global policy environment for health (Kickbusch *et al.*, 2010). Ideally the results of global health diplomacy are reflected in three main following effects:

- To ensure better health security and health outcomes of the population for each of the countries involved (serving national and global interests)
- To improve relations between States and strengthen commitment of a wide range of actors working to improve health; and
- To provide an understanding of health as a common effort for security as a human right and a global public good with the objectives of achieving results that are considered fair for a majority of the population (e.g., reducing poverty, increasing, equity, etc.)

For the academic point of view, it can be seen that these GHD programmes encompass public health disciplines, international relations, management, law and economics disciplines and focus on the negotiations leading global policy environment for health. The main content of these disciplines is aimed for preparing specialists in negotiation of agreements related to public health across national borders and in other fora, global health governance, foreign policy and health and development of national strategies for global health.

Global Health Initiatives

Since the last decade, this academic movement has served according to its promoters for supporting a wide variety of coalitions, networks and alliances, as specialists appointed by the Global Health

Initiatives (GHI), which proliferated in the field of international cooperation for the development, especially of new health policies. Those have been created by the GHI as a necessary step to address complex challenges of the global health agenda and to channel additional resources for health organizational model. Some of the most known are the Global Initiatives for the Eradication of Polio, Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), Global Alliance for Vaccines and Immunization (GAVI), Alliances Stop TB, Roll Back Malaria, Global Alliance for Improved Nutrition (GAIN), Multi-Country HIV / AIDS Programme (MAP) of the World Bank, among others.

Regardless, the reality is there are a few financially and politically important initiatives that are playing a key role in global health governance. One of the most powerful and known is the Bill and Melinda Gates Foundation, a philanthropic institution, which has come to be recognized as an important source of funding and influencing global health activities.

However, growing importance of these GHI raises profound and new challenges, and presses on the sovereignty of states and existing institutional arrangements for international cooperation, taking into account financial resources that enhance decision-making power and intervention at high political and even legal levels.

It is important to note that, despite increased financial resources from the private sector, the public sector continues to provide most of the funds. Private contributions to global health funding are a minor fraction of the total aid. However, private actors have increased disproportionately to the amount of funds which generate greater visibility and control of political power in the framework of global governance.

This is one of the reasons that compel us to consider that results obtained so far are not entirely positive. Most of the funding from the GHI and programmes promoted by the GHD are for disease's vertical control programmes with very little support to strengthen basic health infrastructure and health systems.

In this sense, many of these interventions have recharged the work of national health authorities, undermining national health development. Therefore, if in the past, the main issue was the lack of resources, at present is the problem of how to manage and control this complex network of stakeholders without falling into political and economic interference.

Cuba and its View of the Application of the Global Health Diplomacy

An example of real implementation of diplomacy, based on the international collaboration in health, has been developed by Cuba since the last 40 years.

The Caribbean island, which in 1960 had only three thousand doctors to serve about 6 million inhabitants and an incipient scientific and technological development, has managed to become a model of hope for the international cooperation, taking as its premise the priority that government gives to health and better living conditions for its population.

Issues of the Educational and Healthcare Systems In Cuba

Educational System

Education has always been a major priority of the Cuban Revolution; dedicating significant moments since the 1960s being a National Literacy Campaign.

Since then, the National Education System of the Republic of Cuba is conceived as a set of subsystems organically articulated at all levels and types of education. This system began to develop during the 1960s and 1970s of the last century when they were implemented challenging programmes of training of human resources that allowed thousands of young people prepared in different fields of health and science both in Cuba and in different countries of the world. At the same time the government invested millions of dollars in the creation of universities across the country; creating a network of broad participation and desire to study among youth.

Some of the main features and updated statistical data of the Cuban educational system to understand the results achieved are briefly as follows.

Cuba currently has:⁸

- More than 1100 care centres with capacity for 149 100 children
- More than 9400 Elementary Schools
- More than 1900 Media Education Centers (includes junior high school, high school, technical and vocational education and training of teaching staff)
- More than 195,000 workers linked to teaching.
- 17.6 Teachers per thousand, recognized as the highest number of teachers per capita globally.
- 43 inhabitants per teacher
- 11.5 Pupils per teacher (Middle) Pupil Teacher (High)
- 100 percent Primary school enrollment rate
- Nearly 100 percent Secondary enrollment rate

Moreover, in Cuba there are 62 university-level establishments, of which 17 belong to Ministry of Higher Education, 16 to the Ministry of Education, 14 to the Ministry of Public Health and 15 to other agencies. Those Institutions of higher education include 20 753 full-time professors and 1934 part time associate professors. It should be noted that since 1959 to-date more than one million students have graduated in different university courses and about 40 percent of university graduates were engaged annually in postgraduate courses.

Therefore, we are talking about an established educational system that continuously carried out changes in the direction of improving cognitive abilities of the population.

Health Care System

Meanwhile, since the last 60 years, Cuban government have been operated a national health system and assumes fiscal and administrative responsibility for the health care of all its citizens. There are no private hospitals or clinics as all health services are government-run.

On the basis of the educational system described above and the large investment made by the government a health system across the country has been created including free attention at hospital facilities for all population.

The maternal and child care programme, among other goals, has reduced infant and maternal mortality, leading the concept of preventive immunization of all children who are vaccinated against 13 diseases. Cuba was the first Latin American country to meet the goals of primary health care as the international strategy of Alma Ata, adopted in 1978.

Despite the ongoing United States embargo against Cuba during the 1990s, which caused problems due to restrictions on the exportation of medicines from the US to Cuba, the investment in human resources and facilities have enabled lately a strength that certainly explains the current results of health services in Cuba. Here are some statistical data:⁹

Hospitals : 286 (General Medicine 83, Clinical – Surgical 34, Pediatric 26, Gynecoobstetric 18, Maternal – infant 18, Rural 64, Specialized 43, Nursing Homes 197, Homes Grandparents (daytime only) 67, Homes for the handicapped 38, Maternity homes: 289, Blood banks: 27, Cardiocenters 6, Coordination Medical Emergency Centers 10, Pharmacies : 1,961, Research Specialized Institutes : 13, Science and technology units, 37.

Health Indicators

- Life expectancy at birth: 78.19 years
- Infant mortality rate: 4.1/1000 births
- Mortality of children under 5 yrs: 7.0/1000 live.
- Maternal mortality rate: 3.51/1000 live births.
- Total Health workers: 447.023 Represent 13.2 percent of total workers in the country
- One nurse every 126 inhabitants.
- One Doctor every 159 inhabitants.
- One dentist for every 1066 inhabitants

Given the country's population, and the multiple economic difficulties existing, it can be said that there have been significant achievements as well as a successes in implementation so to

invest in new conditions of life through scientific and technical development in health.

Impact of Education and Health Services of Cuba In Global Health Diplomacy

After five decades from 1959, when Cuba had only 3000 doctors, there has been an increase of more than 70,000 medical specialists, 90,000 nurses, and about 30,000 health technicians, who provide high quality services to more than 11 million inhabitants. More than 134 000 Cuban health workers, trained in the past 40 years, have provided services to more than 108 nations in Latin America, Africa, Asia and even Europe, under different collaborative programmes, coordinated by the Cuban Ministry of Health with support from other governments, non-governmental organizations and the regional Health Authorities. In addition, the Caribbean island has promoted with its own resources and expertise the creation and support of international medical schools in Cuba and several countries where innovative and proactive Cuban teaching method is being used and thousands of young people have completed medical programmes and other health specialties.

During the present century, several examples have shown the style implemented by the government of Havana to employ health and outcomes in the education system as an efficient and supportive mechanism to improve relations with different countries and agencies worldwide following Science Diplomacy programmes.

Cuban Response to the Tsunami Hit in Asian Countries (2006)

Medical teams from Cuba operated clinics in Indonesia and Sri Lanka following tsunami that rolled across the Indian Ocean on 26 December 2006, taking hundreds of thousands of lives.

Cuban government, with the agreement from the Indonesian authorities, implemented fast way transfer of a medical brigade to assist affected population.

The 25 volunteers in the team to Aceh, Indonesia, treated wounds, infections, respiratory diseases and also psychological shock behaviors.

In Sri Lanka, the Cuban volunteer team had set up a temporary clinic in Galle, 70 miles from Colombo, the capital undertaking a demanding work in coordination with the health authorities of this country and international organizations

Earthquake in Haiti and the Response of the Cuban Health System (2010)

Cuba was the first to arrive in Haiti with emergency medical help after the earthquake of 12 January 2010. Solidarity among many nations, Cuba and its medical teams played a key role in assisting earthquake victims. Public health experts said the Cubans were the first to enable medical facilities among the ruins and strengthen hospitals immediately after the earthquake.

Haiti and Cuba signed a medical cooperation agreement in 1998. Before the earthquake struck, 344 Cuban health professionals were already present in Haiti, providing primary care and obstetrical services as well as restoring the sight of Haitians blinded by eye diseases. Medical staff flew shortly after the earthquake as part of the rapid response.

In almost 15 years of presence of the Cuban medical brigade in Haiti, especially after the earthquake, a total of 20 million 946 thousand 528 patients were treated, of which 6 million 792 thousand 394 were seen in their own homes. There were 373,000,513 surgeries, 140 thousand of which 191 were major surgery, and assistance was given for 150,000,336 births, of which 16,000,481 were caesarean. Also, through Operation Miracle programme, returned or improved vision of 60 thousand 281 Haitians, while 322 thousand 753 were treated in rehabilitation, of which 55,000,707 were fully rehabilitated.¹⁰

South–South Collaboration in Biotech Field (2007)

A partnership between the Institute of Immunobiological Technology (Bio-Manguinhos/Fiocruz) of Brazil, and the Finlay Institute in Cuba, allowed an effective response to an emergency

appeal of the World Health Organization (WHO) for distribution of vaccines for the Meningitis Belt in Africa; the area, which stretched from Senegal in the west to the east of Ethiopia, between 2006 and 2007, by at least 14 warnings of disease outbreaks.

Finlay Vaccine Institute based in Havana City with a long history of meningitis research and managed to control a meningitis outbreak in Cuba in the mid-1980s, developing a purified meningococci vaccine that was the first of its kind worldwide. Bio-Manguinhos Institute, located in Rio de Janeiro, also has extensive experience in vaccine research and manufacturing, and has developed an efficient scale-up process using lyophilization. By collaborating and relying on their respective strengths, these two organizations were able to supply, in a timely fashion, meningitis A vaccine capable of combating the African meningitis outbreak.

For other part, the WHO also facilitated the collaboration by making it possible for ANVISA, the regulatory agency in Brazil, to collaborate with the Cuban regulatory agency CECMED. The agencies were able to exchange information about their respective regulatory systems, which made it possible for them to align the collaborative process. Neither Bio-Manguinhos nor the Finlay Institute alone would have been able to respond so quickly and efficiently to this request. This example therefore demonstrates how South-South collaboration can be harnessed to address a health threat when spurred by demand and funding from an international organization. It also shows how South-South collaboration can contribute toward improving global health.

Since the start of production of vaccines for the region, the joint initiative has already provided more than 20 million doses by various international organizations, such as WHO, Médecins Sans Frontières, the United Nations Fund for Children (UNICEF) and the International Committee Red Cross.

Health Policies+International Relations = GHD.

Those were examples upon which we could comment. However, another approach has been the internationalization of agile, safe and free method of health care as that Miracle Operation which has restored or improved vision for millions of Latin American, African and other regions of the world through intergovernmental cooperation programmes that allow free access of patients to public attention system.

As if this were not enough, Cuba has managed to deploy and maintain, an extraordinary scientific and technological system whose highest point is a biopharmaceutical industry through a closed cycle can develop quickly and efficiently, registration and commercialization of vaccines and biopharmaceutical products characterized by its novelty, its quality and especially the philosophical view that is affordable for countries and companies with fewer resources. In this line of work this system today markets more than 50 products to high impact and added value in more than 60 countries on all continents.

These results have been supported by seasoned diplomats from the Ministry of Foreign Affairs who have collaborated with these and other programmes implemented at national level followed by its application in dozens of countries, being besides common in each of these examples, the interaction between the Ministries of Health, Science and Technology and Foreign Affairs which work together in these developing collaborative projects.

With this strength of Human Resources and principles based on the collaboration and solidarity Cuba has become one of the largest and best examples of the practice of GHD.

Thus, using techniques, resources and plans based on GHD this small country has significantly increased its influence and political and trade relations with a large quantity of countries on the basis of ethical and solidarity principles put forward by the political will, the scientific and technical development and the development of

human knowledge, in this case in the field of health.

Conclusions

The world of the XXI century is a complex world, in which the development mankind has achieved in science and technology can't yet deliver real benefits to the entire population of the planet. In our humble opinion, the contrasts and differences between developed and developing countries are increasing every day. In this sense, human health is an essential resource that must be taken utmost care and concern by the governments of nations. If we make a brief consultation to map the planet, we can see that there is a high level of agreement while comparing countries with a fewer resources to those with weak health systems and poor technical scientific development. It is a known fact, but a few people admit it or try to do something about it.

In this sense the GHD is an academic tool which, theoretically, trying to achieve an agreement between the richest countries to raise awareness about the situation and by health policies achieve better results in those countries with lower incomes. That's why, the role of governments is essential, besides NGO, biopharmaceutical industry, regulatory agencies and the educational system of the most industrialized countries. The way that all these actors could be sensitized and act together or not, would depend on the success of this programme, and this can be a first conclusion.

Cuba's example has shown how far a country with few economic resources can carry on actions of solidarity, cooperation and scientific exchange to increase its international relations with countries of the world while helping health thereof. Obviously, there are difficulties, and it's impossible to say that these programmes are perfect, but our intention is to show a different model. Thus, even if it's not a perfect model; through the practice it has achieved incredible success improving lives of many people on this planet through the practice of GHD as a real branch of Science Diplomacy.

Endnotes

1. On the issue expands on the Oslo Declaration signed in 2007 by the Foreign Ministers of Brazil, France, Indonesia, Norway, Senegal, South Africa and Thailand
2. In addition to the aforementioned Declaration of Oslo can be consulted resolutions taken at regional international organizations such as WHO, as the PAHO, which have been analyzed in Official Events Areas Policy and Economic Integration and the European Union, MERCOSUR, ACP, between other.
3. The American writer William McNeill in his book "Plagues and Peoples", published by the Spanish editorial "Siglo XXI" in 1984 relates several examples that allow to support this. Subsequently, other authors such as Laura Nervi, Laurie Garret and Ilona Kirkbusch have extended the analysis of this issue in articles and studies for international organizations such as WHO.
4. This issue is widely reflected in the final document adopted at the 60th. Session of the Regional Committee of the Pan American Health Organization. Available in <http://issuu.com/researchforhealth/docs/cd48-17-english-with-annex>
5. In January 2008, the UN General Assembly adopted Resolution 63/33 which was a boost for the actions that were previously executed in various scenarios.
6. In the article published by Dr. Kickbush and Dr. Berger "Global Health Diplomacy" at. R. Elect.de Com. Inf. Innov. Saúde. R. de Janeiro, v.4, No.1, p 18-22, Mar, 2010.
7. For further information are available articles published by Dr Ilona Kirksbush, M. Thieren and others.
8. In all cases, data are extracted from the website of the National Bureau of Statistics. Available in www.one.cu
9. Ibid
10. Maceo Leyva L. Fifteen years of white coats. Available in <http://www.granma.cu/espanol/nuestra-america/4diciembre-batasblancas.html>

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Science Diplomacy and Higher Education: Case Study of *Prometeo* Programme in Ecuador



Andrea Carolina Echeverria Enriquez*



Lorena Elizabeth Diaz Flores**

Introduction

Ecuador's higher education system is experiencing changes. The National Constitution of 2008 and the Higher Education Law of 2010 have changed the way Ecuador's universities were funded, administered, and accredited. The importance of research was stressed and drastic changes were made for academic qualifications and employment conditions of full-time faculty-members. This paper details about how Ecuador universities are changing to meet challenges of the technological age.

Currently, there are 57 universities in Ecuador; 29 are public and are under the direct supervision of the country's legislation. In the past, the government as well as students covered financial expenses of public universities. However, since public education has become free after 2008 Constitution, and admission of the students are coordinated by the central government, public universities have lately become completely dependent on government approval with regard to their budgets, curriculum innovation, administration and students admission. On the other hand, private universities receive some financial support from the central government, and have some autonomy regarding curriculum development and administration.

Over the years, questions have been raised regarding quality of education of the institutions, especially the private ones. It is difficult to attract foreign talent to work in Ecuador given the relatively low salaries of university professors compared to other countries. And many Ecuadorians who have pursued graduate degrees in other countries have decided to stay abroad, as salaries

* Analyst of International Affairs , Correos del Ecuador CDE E.P., Ecuador

** Analyst of International Cooperation, Ministry of International Affairs, Ecuador

there are competitive and research opportunities are plentiful, and resources are comparatively easier to have.

Since Ecuador's universities are mostly focussing on teaching at the undergraduate level, the graduate-level education is dispersed and not of standard. Many professors and administrators do not hold master's or doctoral degree; and less than 5 percent of Ecuador's professoriate have PhD degree, that to from abroad. At present, only two universities in the country offer PhD degree in social sciences. In fact, no PhD studies, so far, have been completed in Ecuador.

Ecuador has created a legal framework to reinforce and promote technology and science development. Under this context, public policy, institutions and programmes have been created by the central government. This paper is focusing on one initiative on the higher education, called "Prometeo Programme".

First, the concept of science diplomacy and the way it is connected to education would be narrated. It would describe the attempt to raise the level of Ecuador's system of higher education and its impact on faculty and administrators. Next, would be a brief description of the project location and its main characteristics. Then, focus would be on the general information about the Secretariat of Higher Education, Science, Technology and Innovation (SENESCYT). This Secretariat was created to regulate education, science and technology in Ecuador.

Subsequently, it would give details of the singular programme created by the Secretariat – Prometeo Programme, and then its vision and objectives would be chalked out. Following, examples of projects under the programme and their results would be analysed. Finally, there would be assessment and the impact of this programme on Ecuador's educational level.

Approaches to Science Diplomacy

Humanity's greatest challenges – and some of its most promising opportunities – are regional and global. Increasingly, the world requires effective partnerships among scientists, policy-makers and diplomats.

Science diplomacy takes many forms – When nations come together to negotiate cooperative agreements on fisheries management or infectious disease monitoring, they need scientific expertise. When scientists come together for complex multi-national projects in astronomy or physics, their nations devise diplomatic agreements on management and financing. And when political relations between two nations are strained or broken, joint research efforts can give them a way to keep interacting, and build trust. At present, the need for science diplomacy is growing.

More countries are strategically incorporating science into their foreign policy. This author describes national case studies that show key drivers and approaches for how certain countries utilize, or should utilize science diplomacy.

Nature of the science and technology, the speed with which it is developing and spreading, and the extent it is essential to national priorities is leading more countries to look at the international component of their science strategies. The result is greater policy emphasis on the issue broadly defined as science diplomacy, which reflects ways in which countries incorporate science in their foreign policy. This trend is taking place partially because issues the foreign policy community face are becoming more technical, necessitating a greater understanding and use of science and technology.

Countries often need to cooperate at a large scale to address most complex and expensive scientific and shared challenges; requiring successful interaction of scientists and diplomats. The infrastructure is often the most challenging and also most visible of science diplomacy of a country.

Research has historically received very little support in Ecuador universities, and the system does not provide adequate means for successful research: the research infrastructure is outdated, there are no incentives for faculty to do research; there are no mechanisms to attract students to participate in research projects; and there is a lack of understanding of basic research methodology at the undergraduate, graduate and faculty levels.

The Ecuadorian case: Prometeo programme is an innovator for the interchange of PhD students, and presents a unique foreign policy challenges. The interaction with international universities allow Ecuadorian students to be the part of the international challenges, focusing on facilitating dialogue between academics, students, and practitioners of science diplomacy in different fields.

Ecuador: location and special features

Ecuador is located in South America. It has four regions-the Galapagos, the Coast, the Andes and the Amazon. Due to its location in the middle of the world, this nation is among the 17 most biodiverse countries. It has exotic and endemic species of flora. Within its territory 1,600 species of birds, 350 species of reptiles and 400 species of amphibians can be found. This country has around a sixth of all vegetal life of the planet in less than 1 percent of its surface.

Its cultural diversity can be found in 15 indigenous nationalities, 13 native languages and different customs, gastronomy and festivities. To preserve its flora and fauna, many protected areas have been created and are safeguarded by legislation. Nature and cultural diversity of the country bring a great potential to plan a variety of research projects (Senescyt, 2018). Given these advantages, such as unique flora and fauna, its government has seen development opportunities and has looked for opportunities to exploit them in favour of its development. A need to create technology and conduct research to improve social and economic conditions has resulted in changes on Ecuador's public policy; seen on the legal area.

Ecuador's Constitution has created a framework under which education has been given priority on the public policy area. It promotes and encourages science and technology development as a platform to attain a good quality life for its citizens (Asamblea Nacional República Del Ecuador, 2008; Senescyt, 2018). Under this framework, the Secretariat of Higher Education,

Science, Technology and Innovation (SENESCYT) has been created.

Its mission is to direct public policy on areas such as science and technology with the aim of promoting research, innovation and technology transfer. This would be achieved through elaborating, executing and evaluating policies, programmes and projects. As part of this promotion of development of science and technology, this Secretariat has established Prometeo Programme.

Prometeo has been named as an emblematic programme for the country due to its scope and objectives. Its creation was driven by the idea of founding development on the training of human talent. The main objective of this programme is to develop research capacities of higher education institutions and governmental entities to strengthen strategic sectors of Ecuador. It is aimed to have foreign and local experts with extensive experience on their fields of study. A number of fields of knowledge have been established as priority by the government. Among these, are production and innovation, life and natural resources, economics, business education, administration, social and behavioural sciences and art and culture (Senescyt, 2018).

Prometeo Programme: Technology and knowledge creation

Ecuador public policy has been focused on creating an environment that offers conditions attractive not only to national but to international researchers. It has promoted natural and cultural advantages of this country due to its geographical location and cultural diversity. Prometeo Programme has become a development tool for Ecuador, as it focuses on the specific needs of the country, its growing opportunities and strengths. This has been achieved due to priority areas of the government where studies are needed and projects are to be executed. The reason of setting these guidelines is to make these projects go along with the development objectives set by the government, and thus have a real impact on the society.

Ecuador's universities were in need of a change, and the 2010 Higher Education Act, compelled faculty-members to seek advanced degrees; and universities paid greater attention to research.

Among the activities that researchers have to carry out are execution of a research project, transfer of knowledge to national research and academic teams, promotion of research networks and international cooperation, review and publication of papers and books, publication of research results, organization of seminars, lectures and workshops. seventy seven percent of the researchers worked with universities, polytechnics and trained 57000 professors till 2014 (Senescyt, 2018). Through all of these activities, assurance is that the knowledge is not centralised and it is reachable to people. Importance of sharing information is highlighted, and it should be used in a way that has wider impact on the society.

One of the research projects developed under Prometeo Programme was focused on the agricultural area. Maria Carmen Tarsila Martinez Gomez, a Spanish researcher, decided to develop a project to stimulate the defense system of a local plant named "lulo" to avoid use of fungicides or chemical components. Martinez chose Ecuador for doing this project because of the advantages offered by the Prometeo Programme. She was keen to work in a developing country, and was attracted to Latin America because of its culture and language. One of the most remarkable aspects of this project was that it was for the first time that genetic analysis of lulo plant could be carried out. According to the researcher, the main beneficiaries of this study would be farmers, since huge loss of product could be avoided by the application (Senescyt, 2017).

The Prometeo Programme allows scientists to work on its flora that is unique in this part of the world. It is important to highlight that this kind of projects have offered the opportunity to have access to plant life that was not studied earlier. Given that the studies are done under the parameters based on the country's needs, they have a direct impact on Ecuadorian society. These

studies have allowed researchers to work on projects and come out with results that improve agricultural sector and would directly impact local economy.

Another project developed under the Prometeo Programme was on water resources. Francisco Alcala decided to apply for this programme because of Ecuador's weather, geography and environment. His study was focused on the evaluation of climate change on the underground water resources on Tungurahua province. This project gave the first data on the chemical components of the rain. It is important to highlight that this project was designed under the priority areas by Prometeo Programme (Senescyt, 2017).

Another project was executed by professors and students from the Salesiana Polytechnic University and they worked together with the Prometeo Programme. Their project focused on designing and developing a wireless system that would allow monitoring patients suffering from Parkinson. This tool would revolutionize diagnosis of the illness as it would register precisely the disease progress. This work was done by Monica Huerta for the Prometeo Programme. She had 20 years of experience on the electronic area related to medicine. Students from Salesiana University and also a neurosurgeon ,with experience on Parkinson disease, were involved. Besides creating new knowledge, this project allowed students to get involved with research. It received awards such as – "Matilde Hidalgo award to Education, Science, Technology and Education" and "Award thesis project, devices design" (Senescyt, 2018).

This project would clearly improve the quality of life of Ecuador's citizens. It would have a tangible effect on the social area, especially, in the health-care system. Another benefit from this is that it allows youth to get involved. This is an example of how the experience and knowledge acquired by the leader of the project is shared with local students. Shared knowledge means that this area of expertise can be deepened in future studies; and the results can be improved and the scope of impact would be widened and would benefit larger population.

Results

Up to December 2014, there were 819 Prometeo researchers, who prepared 912 projects and published 265 articles in indexed scientific journals. And 100 of the researchers were Ecuadorians, the rest came from 48 countries. One of the main economic attractions includes a monthly allowance from USD 4 320 to USD 6 000. The scheme has invested USD 27 million between 2013 and 2014. It planned to allocate USD 20 million on 2015. The Polish psychologist Mariusz Wotonciej arrived in the country in November 2013 to measure impact of culture and education on the youth entrepreneurial spirit. It also plans to promote inclusion of people with mental disabilities as well as creation of playful learning spaces for children. He is writing a book reviewing his programme: it includes improvement of a tool to diagnose skills of seniors at school (Senescyt, 2017).

The projects chosen to be a part of Prometeo Programme are linked to the needs of the higher education centres. The first step for applying to this Programme is to approach to the host university. Scholarships are only granted when the project cannot be developed by Ecuadorians. The Spanish researcher David Vila, who works as a fellow at the Institute of Higher National Studies (IAEN), emphasizes that the main strength is the stability and adequacy of the institutional work climate, along with the ease of focusing their resources towards research. And the weaknesses of the programme is the normal phases of initial development of any research system. He works as a part of the Good Knowledge / FLOK Society project. (Senescyt, 2017).

Despite the positive impact of the projects executed under Prometeo Programme, weaknesses have been detected too. One of the problems was that when researchers arrived to the host institution, they did not have adequate equipment in the laboratories. Given this situation, they were limited to focus only on administrative tasks. In addition, there were complications while training local professors due to lack of motivation, time and learning flexibility.

Lack of equipment and organization on the side of host institutes is an obstacle for researchers. It is important to highlight that this represents misuse of resources of the central government as the researchers were not able to work on the project they were supposed to develop. There should be a complete assessment of not only the need of studying a determined area of knowledge but there should be a combined work between SENESCYT and the host institution to assure availability of required equipment to carry out investigations.

Ecuador faces changes on its education system. These are happening fast and their results would only be evaluated in future to determine whether these changes have brought the desired effects.

Conclusion

This paper has developed the concept of science diplomacy focused on education. It has defined the characteristics of Ecuador like its location and natural assets. It also highlighted the way in which this country's public policy has created the legal framework and institutions to promote development of knowledge and technology. With the help of three projects driven under Prometeo Programme, this article has exemplified the impact that research has in agriculture, hydrology and medicine. Moreover, the areas of research had been defined accordingly with the development plans set by the national government. This means that the technology and knowledge resulted from this programme was of use and had a positive impact and would improve social and economic conditions of this developing country.

Research has historically received very little support in Ecuador's universities and the system does not provide adequate means for successful research: the research infrastructure is not updated. One of the most important things that the government has to invest in is to give latest equipment to universities so that researchers can fulfill their objectives.

There are no incentives for faculty- members to do research. In addition, there are no mechanisms to persuade students to participate in research

projects, and there is a lack of understanding of basic research methodology at the undergraduate, graduate and faculty level.

Ecuador's universities were in the need of a change, and the 2010 Higher Education Act forced faculty members to seek advanced degrees and universities to pay greater attention to research.

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Promoting Cyber Security through the Effective Use of Science Diplomacy in Ghana



King David Cartey*

Introduction

Ghana, a Middle Income Country, in the West African region of the African Continent shares borders with Togo at the East, Burkina Faso on the North and Cote D'ivoire at the West. Ghana stands alone as the only English speaking country among these three Francophone countries with the Gulf of Guinea, representing Ghana's territorial waters at the South. It has a population of about 28 million with diverse ethnic groups dominated by the Akans. Growing economies are the outcome of technological advancement and scientific mechanisms, so cyber-crime cannot be overlooked, hence the need for Ghana is to intensify its cyber space with emerging scientific and technological approaches through Science Diplomacy. Science Diplomacy is an emerging strong tool for diplomacy and foreign policy, and is often based on the countries' principal objectives and interest to address common problems as they build constructive international partnerships. This can be identified in three dimensions – Science in Diplomacy, which is known to be the action whereby science informs foreign policy objectives, Diplomacy for Science, This is where Diplomacy facilitates science cooperation, whilst Science for Diplomacy, where science cooperation among Nation States improves international relations.

Cyber Security Systems

Cyber Security cooperation remains a prominent area of mutual interest among different countries of the world. For instance, Singapore's Cyber Security Agency (CSA) and the US Department

*Research Officer, Parliament of Ghana, Ghana

of Homeland Security have lately established a formal cyber security partnership. This agreement would improve bilateral cyber security and would potentially create mechanisms for ASEAN nations to address better their cyber security challenges. It is in this face that Ghana government through its Ministry of Communication is on the rapid pace to ensure establishment of a National Cyber Security Centre (NCSC) as has been done in some other countries to liaise with relevant state agencies, the private sector, countries within and outside Africa, to oversee cyber security operations at all levels. Ghana's flagship policies like the national identification system, the digital property addressing system, e-payments, digital financial services and various e-government initiatives can be undermined simply by cyber-crime.

Cyber-security issues are currently national security threats; Ghana cannot fully reap digital dividends, associated with her adoption of the ICT as a means of our socio-economic transformation, if the country fails to mitigate existing and emerging cyber security threats. On 23 October 2017, the President of Ghana declared the National Cyber-Security Week, and inauguration of the National Cyber-Security Inter-Ministerial Advisory Council, which would work closely with the National Cyber Security Technical Working Group (NCSTWG) acting as the main driver for the implementation of Ghana's National Cyber Security Policy & Strategy (NCSPS). This would ensure enforcement of existing legislation, as it works to review if need be and empower the Data Protection Commission to ensure enforcement of the provisions of the Data Protection Act, 2012 (Act 843). Regular capacity-building trainings, workshops and seminars would be organized to improve forensic capabilities of the Criminal Investigation Department (CID), prosecutors and other law enforcement agencies, including the Economic and Organized Crimes Office (EOCO) and security officers, for enabling and strengthening investigations and prosecution of cyber-facilitated crimes, especially Judges, to update their knowledge on criminal justice response to cybercrime legislations and enforcing fairly provisions as a priority.

The Government of Ghana, through the Ministry of Communication, is presently working on the establishment of a dedicated Computer Emergency Response Team (CERT) to protect critical national information infrastructures and sectorial CERTs for different sectors of the economy based on international standards and benchmarks as a showcase to the world of Ghana's cyber security emergency response readiness. "We have to promote a cyber-security culture among our people, the era of taking chances with the virtual world should end." - President Akufo-Addo (2017).

Science Diplomacy in Cyber Security

Traditionally, countries compete over power, influence and resources. And, when resources are concerned, usually oil, gas, cocoa and rare earth metals (gold, diamond, bauxite) come to mind. There is, however, one resource that stands tall above all the others: Science & Technology. Diplomatic negotiations missed emerging technologies, and became more economic centred with respect to who pays what and who does what. Negotiations must be based on the principles that unite the world more than what divides it. In this regard, Africa and Asia, where majority of the world's people, about 80 percent, lives should have an unflinching interest to transform world speedily through science and technology. Science, in general, is bringing countries together which may not come together because declining of the best leads to nothing but rising of the best. Science Diplomacy is predominantly gaining wider currency lately though but its origin can be traced to 1729, when first foreign secretary was appointed. In as much as self-reliance is important, countries opening up for import of technology have liberalized development at a faster pace.

The debate about diplomacy in the digital age has been recklessly profligated with terminologies. Terms such as e-diplomacy, cyber diplomacy or digital diplomacy are being used almost interchangeably, with each writer sticking to his/her favorite. This wastes three perfectly good

terms where one could be used. It also creates considerable confusion about the relationship between the diplomacy and the digital world.

The government of Ghana through one of the dimensions of Science diplomacy: Diplomacy for Science has negotiated and partnered with the United States government through the Security Governance Initiative (SGI), and the European Union, through their GLACY project, to support country's efforts at addressing cyber security challenges. The Nation through Science for Diplomacy means would further engage international institutions and technological partners such as International Telecommunication Union (ITU), the Commonwealth Telecommunications Organisation (CTO), Google, Facebook and Microsoft, to ensure cyber safety for Ghanaian citizens as well as promote Cyber Security enforcement in the sub-region.

Further, in demonstrating international co-operation towards addressing the challenges of cyber security, Ghana has signed the African Union Convention on Cyber Security and Personal Data Protection, at the 29th AU Summit in Addis Ababa in July 2017. The country, however, intends to access fully the "Budapest Convention" that seeks addressing internet and computer crime by harmonizing national laws, improving investigative techniques, and increasing cooperation among nation-states after getting approval from Cabinet and Parliament.

Challenges

"Every minute we are seeing about a half million attack attempts that are happening in cyber space"- Derek Manky, Fortinet Global Security Strategist. There is a global paradigm shift in national security discourse with much attention on cyber security; following are some challenges facing the nation states around the world.

- Cyber Security has become a National Security problem and it's affecting everybody from top to bottom or bottom to top, making it a universal issue.
- Cyber Crimes cost Nation States a lot of money,

the UK for instance lost 27 billion Pounds as reported by the UK cabinet office. The NATO also has informed that Cyber-crime drains one trillion dollars from the economy yearly.

- Cyber Crimes are borderless and every country is vulnerable since it doesn't need to be launched from a specific place or a country.
- The Future of Threats and Threat Technologies in 2009 reported that cloud computing provides the next opportunity for criminal attacks on data centres.
- The Israeli Electricity Authority had its own share of e-hacking experience when it was hit by a severe Cyber-attack virus, which paralyzed computers. – Dan Goodin (2016).
- The inability of adequate laws governing cyber-crime in Africa especially makes it more comfortable for cyber criminals to operate in that region.
- Cyber-crime activities lead to high level of sim box fraud and mobile devices security threat in Ghana and its environs.

Recommendations

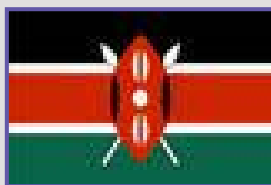
- **Home country relevant stakeholder engagement:** Ghana must identify and involve potential and relevant institutions as well as all security agencies including international cooperation representatives to play a part in promoting cyber security to curb increasing rate of cyber-crime. It is an all-inclusive fight.
- **Regional/Sub- regional cooperation** is a key phenomenon that must be harnessed together to curtail such menace, being a canker which is gradually eating into the fabric of the national security and making cyber security weak. An agenda of common interest must be outlined as early as possible among regional bodies to enable a strong cohesion of regulations against cyber-crime, leading to a win-win end.
- **International cooperation** must come together as often as possible to negotiate and enforce new relevant approaches needed to boost cyber security. This would put the world as a whole in a safer place; not only Ghana. The world must fight a good course together but on principle.

Conclusion

Science Diplomacy as a soft power is advancing with strong grounds and spreading its roots widely across the globe. This, however, is a combination of Science and Technology, Foreign Policy and National Security upon which the case of Ghana's cyber security falls within. It is also worthy to note that multilateral and bilateral decision-making is based primarily on consensus as every country has only one vote. Ghana, however, has exercised its scientific collaboration of science diplomacy by cooperating with the United States of America and the European Union to establish the National Cyber Security center (NCSC) with a single aim of curbing rising menace of cyber-crime in the world, African nations, particularly, Ghana to improve strained international relationships.

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Use of Science Diplomacy in Promoting Kenya-India Collaborative Research in Access to Benefit Sharing (ABS) Protocol



Cyrus Kamau Kihuha*

General Introduction

Kenya was one of the nominated countries as the national case study for the ABS Capacity Building Initiative. The country assessment of its viability as a test-bed was carried out in September 2015 with a work- plan adopted in April 2016. Development of a single-window online portal to manage ABS applications and permits was mooted to enable Government Agencies for performing a targeted monitoring of utilization of Kenyan genetic resources and associated knowledge by researchers. Researchers planning to carry out research in Kenya or with materials from Kenya are supposed to seek research permits from designated national resource providers.

This ABS permit is evidence that researchers and resource providers have entered into Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT). Moreover, in specific cases, an export permit is required, and the agency involved would process its grant. There is a certain level of cooperation in the administration of permits, particularly where a permit is required from one preceding authority before the other authority grants a permit. A single- window online system would increase compliance with Kenyan ABS regulations, reduce duplication of effort, minimize workload on authorities, improve quality of service to researchers, and finally facilitate research and development as the basis for access and benefit- sharing.

The process involved identification of NEMA¹, KWS,² KFS,³ KEPHIS,⁴ and NACOSTI⁵ core permit processes, detailed study and analysis of current processes and design of a suitable single

* Chief Scientist, Infrastructure (Engineering) and ICT, National Commission for Science Technology and Innovation, Kenya

window system. Kenya is a signatory to different international treaties and conventions; among them are the Convention on Biological Diversity as well as the Nagoya protocol.

Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is an international agreement (negotiated under the guidance of the United Nations), adopted at the Earth Summit in Rio de Janeiro in 1992. The ABS Capacity Development Initiative aims to contribute to poverty reduction, food security, and technology transfer, social development, including equity and rights and biodiversity conservation. It has following three main objectives:

- a) to promote conservation of biodiversity;
- b) to use its components in a sustainable way; and
- c) to share fairly and equitably benefits arising from the use of genetic resources.

As one of the most widely ratified international treaties on the environmental issues, it has generated enormous interest in biodiversity, both in developed and developing countries. To advance further the implementation of the third objective, the World Summit on Sustainable Development (Johannesburg, September 2002) called for the negotiation of an international regime within the framework of the Convention to promote and safeguard fair and equitable sharing of benefits arising from utilization of genetic resources. The Convention's Conference of the Parties responded at its seventh meeting in 2004 by mandating its *Ad hoc* Open-ended Working Group on Access and Benefit Sharing to elaborate and negotiate an international regime on access to genetic resources and benefit-sharing. After six years of negotiation, this working group efforts resulted in the realization of Nagoya Protocol.

Nagoya Protocol

This for access to genetic resources and the fair and equitable sharing of benefits arising from their utilization was adopted at the tenth (10th)

meeting of the Conference of the Parties on 29 October 2010, in Nagoya, Japan. Researchers working with genetic resources and associated data would require greater attention since the Nagoya Protocol on Access and Benefit Sharing (ABS) has come into force in October 2014.

In some countries, all these functions are within the ministries, while in others these have been domesticated through agencies and through independent institutions as set out in the respective laws. In Kenya, the Nagoya Protocol came into force after the present ABS regulations were domesticated. Guidance have been provided in CBD, Nagoya Protocol, IUCN explanatory guidelines, and the AU-ABS guidelines. Further guidelines can be obtained from different country's domestic measures such as the EU-ABS law, Brazil ABS law, Ethiopia ABS law, and Costa Rica ABS law, among others. The frameworks should have legal clarity and certainty, simple and with no arbitrary rules.

ABS Regime

Researchers planning to carry out research involving genetic material and associated traditional knowledge from Kenya must seek research permits from multiple agencies. In specific cases, an ABS permit and export permit may be required as well. Several independent government institutions (each with its own mandate, laws, policies, acts and legal policies) are involved in the permitting process at different level. There is a certain level of cooperation in the administration of permits, particularly where a permit is required from one authority before the other authority grants a permit; different institutions largely operate independently (in silos) thus there is a lack of co-ordination and clear communication structure. Researchers are faced with a situation whereby they need to visit multiple offices, make multiple applications and with uncertainty await for longer times before getting a requisite research permit. In some instances, a researcher who unknowingly fails to have applied and does not have receipt of a permit from one agency is forced to abandon a phase of research since he/she must then secure missing permit before proceeding further.

This results in frustrations to researchers, and discourages making Kenya as a research destination uncompetitive (from longer periods taken) and in some cases illegal research and transfer of genetic resources taking place. Moreover, there are duplication of research efforts since there is no single window portal of research in Kenya that would serve as a reference point in monitoring research being carried out and accessing what genetic resources or associated knowledge. After research permits are issued, there are no mechanisms to enforce compliance and to allow monitoring of issued permits. This is owing to ambiguous policies and laws to monitor ABS research.

Salience of Biological/Genetic resources and Traditional Knowledge in Scientific R&D

Biodiversity at present is a critically important environmental and developmental issue. There is a need to implement Articles 15 (Access to Genetic Resources) and 8(j) (Traditional Knowledge) of the CBD. CBD addresses measures geared towards identification, understanding and monitoring of biological diversity and its impact. However, some challenges identified are, like inadequate funding, inadequate skills/competencies; inadequate infrastructure and facilities; weak knowledge management and low investment in physical sciences research facilities.

Researchers must ensure that they have legal clarity in how they can and cannot use Kenyan genetic resources on which they carry out research. Not only must they work within the spirit in the Convention on Biological Diversity (CBD) but also they have legal and regulatory requirements to meet. Although the Nagoya Protocol was negotiated and agreed globally, it is the responsibility of each of the state to develop its procedures and practices

Earlier research related to R & D was without a specific policy, legal and regulatory framework for the ABS. As the result, most of these research permits took longer to be prepared and approved. The key realization regarding benefits (financial or otherwise) of the research to Kenya, was lost. In addition, there was also uncertainty

about the legal processes by which permits and contracts were negotiated and approved. The development and implementation of the ABS Single system is the first step by the country to address constraints and challenges faced by researchers when applying for research permits in Kenya and actualization of research and development benefits for the Country.

Kenya-India Linkages and Development Partnerships

Kenya gained independence from Britain in 1963; with a population of nearly 40 million (42 percent below 14 years), The country has a great ethnic diversity. And Kenya and India are members of the international fora of the likes of United Nations, Non-Aligned Movement, Commonwealth of Nations, G-77 and G-15 and the Indian Ocean Rim Association for Regional Cooperation, and they often cooperate with each other on these fora. The Indian Diaspora in Kenya has contributed actively in the trade and culture and Kenya's progress has been attributed to India's involvement and support in health, academics and research along with many Kenyans who studied in India.

In the recent times, there is a growing trade (US\$ 3.87 billion in 2013-14) and investment partnership. Indian firms have invested in telecommunications, petrochemicals and chemicals, floriculture, etc. and have executed engineering contracts in power and other sectors. There have been a series of high-level exchanges between India and Kenya. An India-Kenya Trade Agreement was signed in 1981, under which both countries accorded Most Favoured Nation status to each other. The India-Kenya Joint Trade Committee (JTC) was set up at the ministerial level in 1983 as a follow-up to the agreement.

Objectives of the paper

The objective of this paper has been to conduct a comparative overview between Kenya and India in the management of biodiversity under the Rio '92 agreement and the Access to Benefit Sharing (ABS) as was envisaged in the Nagoya Protocol. Considering India's science, technology and innovation advancements in ABS administration,

management and use, the paper seeks to identify strengths and opportunities for collaboration bilaterally, and the areas include the following:

- Capacity-building of resource persons responsible for collecting, collating, analyzing and disseminating information relating to biodiversity policy and law;
- Development of tools, methodologies, guidelines, capacity -building for strengthening frameworks for implementing ABS provisions of the Biological Diversity Act; and
- Establishment of collaboration for strategic, programmematic, institutional and long-term cooperation and institutional strengthening in the implementation of biodiversity related issues.

Kenya Situational Analysis

The Government of Kenya (GOK) is currently implementing Vision 2030; the country’s development blueprint covers period from 2008 to 2030. This Vision 2030 aspires for high quality Research and Development (R & D) services and facilities for promoting research-related services within the country

Kenya Economic Outlook

The *Global Economic Prospects* report of World Bank forecasts Kenya’s economy to grow by 5.5 percent in 2018 up from 4.9 percent growth it projected for 2017 as the inflation eases; which was driven mainly by services (which accounted for 66 percent of growth) and industry (which accounted for 19 percent of growth). Agriculture

accounted for 15 percent of growth, the lowest in the recent years. Growth in services was driven by real estate (which grew 12 percent) and transport and storage (which grew percent), and growth in industry was driven by construction (which grew 8.2 percent) and manufacturing (which grew 6.2 percent).

Science, Technology and Innovation

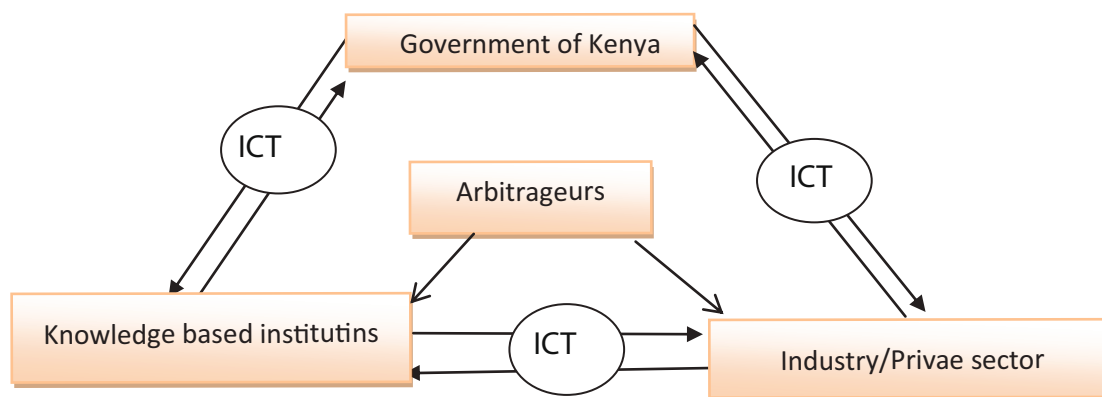
The framework of a functional and sustainable knowledge-based economy predicated on the Public Private Partnerships (PPP), called “Triple-helix type 4” (Figure 1) which involves linking Knowledge based Institutions (KBIs) or academia with industry/private sector; the Government, and arbitrageurs (financiers).

This model of development has not yet properly taken roots in Kenya although legal mechanisms and implementing institutions such as KENIA and Linking Industry With Academia (LIWA) have been established and operationalized for dealing with it.

Scientific Cooperation

Kenya is engaged in a number of strategic agreements for different forms of partnerships and collaborations in ST & I with a number of countries and organizations. The country has acceded to a number of international treaties touching on ST&I for which many Government entities are the National Focal Point. There is a need to review existing agreements (MoUs) to reflect current global and national realities in ST&I and socio-economic dispensation and ensuring

Figure 1: Triple-helix type 4



strategic value for Kenya. Further, the projects rationalize Kenya's Focal Point institutions for many global commitments in the ST&I.

Some of these engagements are: Indo-Africa, Japan-JICA, Korea-KOICA, Joint Commissions - Africa and Middle East, Europe, America, etc. Multilateral cooperation's include, the United Nations Development System (UNDS), Biological Toxins Weapons Convention (BTWC), International Center for Genetic Engineering and Biotechnology (ICGEB), etc.

ABS Regime

Kenya was selected to be one of the partner countries in the current work-plan from April 2015 to March 2018 of the ABS initiative. In summer 2015, in collaboration and with authorization of the Kenyan Government and Ministry of Environment and Natural Resources the ABS Initiative team conducted an assessment of the country. After the assessment, there was consensus that a shared online system would increase compliance with Kenyan ABS regulations, reduce duplication of efforts, reduce workload for authorities, improve quality of service for applicants, and finally facilitate research and development as the basis for any benefit sharing while at the same time enforce compliance and monitoring of the issued permits.

The current efforts in Kenya towards a system that fosters certainty, transparency and clarity in the access and use of genetic resources, was founded on the basis of this law. There have been several efforts to support implementation of the Nagoya protocol in Kenya. One output of the efforts and processes has been the ABS toolkit. This toolkit documents requisite process for accessing the genetic resources in Kenya. According to the ABS toolkit document there are ABS challenges in Kenya like individuals have trouble while seeking to access the genetic resources or the associated knowledge for research or commercial purposes due to various licenses/permits issued by various government institutions.

India Situational Analysis

Trade and Economic Ties with Kenya

India and Kenya have growing trade and commercial ties. Bilateral trade amounted to \$2.4 billion in 2010-2011 but Kenyan imports from India accounted for \$2.3 billion; the balance of trade was heavily in India's favour. India is Kenya's sixth largest trading partner and the largest exporter to Kenya. Indian exports to Kenya include pharmaceuticals, steel, machinery and automobiles while Kenyan exports to India are largely primary commodities such as soda ash, vegetables and tea. Several leading Indian public sector insurance companies participate in KenIndia Assurance Co. Ltd. More recent investments by the Indian corporate in businesses in Kenya include Essar Energy (petroleum refining), Bharti Airtel, Reliance Industries Ltd. (petroleum retail); Tata (Africa) (automobiles, IT, pharmaceuticals, etc.)

India offers 101 fully funded scholarships annually for Kenyans for training them in technical skills under its Indian Technical and Economic Cooperation Programme. The late Kenyan Nobel Peace laureate and environmentalist Prof. Wangari Maathai was conferred the 2005 Jawaharlal Nehru Award for International Understanding in March 2007 by the then Indian President, Shri APJ Abdul Kalam. She was also conferred the 2006 Indira Gandhi Award for Peace, Disarmament and Development by the President, Smt. Pratibha Patil in November 2007.

India's Pan-African e-Network project seeks to make available tele-education and tele-medicine facilities to African countries including Kenya. Indian investments in Kenya are worth \$1.5 billion, and India's pharmaceutical exports have played a key role in making essential drugs available at the affordable prices in Kenya

ABS Regime

The CBD provides a road map for the conservation and sustainable and equitable use of biodiversity. It emphasizes that biodiversity occurring within a nation is the sovereign property of its people.

In pursuance of the CBD, the Indian Parliament passed the Biological Diversity Act 2002 (BDA) for:

- 1) Conservation of biodiversity,
- 2) Sustainable use of its components, and
- 3) Fair and equitable sharing of benefits arising out of the use of biological resources and associated traditional knowledge. (Similar to the Kenya Domestication of the RIO '92.)

To strengthen capacity of these institutions, and to bring in behavioral changes to manage natural resources in an integrated, participatory and sustainable manner, UNDP is supporting a project in five selected districts of the two Indian states (Madhya Pradesh and Jharkhand).

The National Biodiversity Authority (NBA) was established by the Central Government in 2003 to implement India's Biological Diversity Act (2002). The NBA is a Statutory Body and it performs facilitative, regulatory and advisory functions for the Government of India on issues of conservation, sustainable use of biological resources and fair and equitable sharing of benefits arising out of the use of biological resources. It provides a framework for access to biological resources and sharing benefits arising out of such access and use. The Act also includes in its ambit transfer of research results and application for intellectual property rights (IPRs) relating to Indian biological resources.

The Biological Diversity Act (2002) mandates implementation of the provisions of the Act through decentralized system with the NBA focusing on advising Central Government on matters relating to conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilization of biological resources; and advising the State Governments in the selection of areas of biodiversity importance. The NBA considers requests by granting approval or otherwise for undertaking any activity in biodiversity use.

The NBA offers a wealth of information on ABS regulations, procedures, projects and the

various permits issued. It delivers its mandate through a structure that comprises the Authority, Secretariat, SBBs, BMCs and Expert Committees. Since its establishment, NBA has supported creation of SBBs in 29 States and facilitated establishment of around 62,500 BMCs.

The National Biodiversity Authority gives approval, based on the agreement with the State Biodiversity Boards (SBBs), only after establishing mutually agreed terms (MAT's) and an equitable benefit-sharing agreement between the users of the biological resources and associated knowledge and concerned local bodies and benefit claimers.

The State Biodiversity Boards (SBBs) focus on advising State Governments, subject to any guidelines issued by the Central Government, on matters relating to conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilization of biological resources. The SSBs also regulate, by granting of approvals or otherwise upon requests for commercial utilization or bio-survey and bio-utilization of any biological resource by the Indians. The local level Biodiversity Management Committees (BMCs) are responsible for promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling knowledge relating to biological diversity.

In cases where an approval of the National Biodiversity Authority is required for the use of Indian biological resources and associated knowledge and such an approval is not obtained, the punishment can extend to five years imprisonment or a fine of ten lakh rupees or both. In cases where the State Biodiversity Board needs to be intimated about the use of Indian biological resources and associated knowledge, and it is not done, the punishment can extend to three years imprisonment or a fine of five lakh rupees or both. Any offence under the Act is cognizable and non-bail able.

Kenya-India Collaboration in Research on CBD and ABS Protocols

The National Biodiversity Authority (NBA) has set up the Centre for Biodiversity Policy and Law (CEBPOL) to deal with emerging and current biodiversity governance and policy-related issues. The objective of this collaboration is the provision of professional support, conducting research, capacity-building activities, advice and expertise to the Government of India and Norway on a sustained basis.

The NBA conduct capacity-building workshop on “Nagoya protocol” for the ASEAN, East Asian and South Asian countries to share India’s experiences relating to ABS and traditional knowledge. It collaborated with ACB for strategic, programmatic, institutional and long term cooperation on biodiversity related issues. The overall objective was “to train senior level policy makers on issues of ABS and TK for an effective implementation of the Nagoya Protocol on ABS as well as engage in effective implementation of national ABS provisions for sustainable development in India and ASEAN regions”.

The UNEP-GEF and MoEF Project on strengthening implementation of the Biological Diversity Act and Rules was with focus on its Access and Benefit Sharing (ABS) Provisions. The GEF project on ABS was the first ever global project - a programme to access genetic resources, assess their economic value and share the benefits arising out of them among the local people. This project is being implemented in five states of India, Andhra Pradesh, Gujarat, West Bengal, Himachal Pradesh and Sikkim, and it is funded by Global Environmental Facility (GEF) and Government of India. The executive organisations are the National Biodiversity Authority (NBA) in collaboration with five SBBs, UNEP-Division of Environmental Law and Conventions (UNEP/DELCO), United Nations University - Institute of Advanced Studies (UNU-IAS).

From the above, it is evident that India has a highly developed mechanism (Establishment

of SBBs, BMCs and Expert Committees) in the management of biodiversity. The Biological Diversity Act (2002) allows decentralized system, where state Governments have the control in biodiversity management. The NBA focuses on advisory role to the Central and State Government on matters relating to conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilization of biological resources. This has been simplified through the establishment of an online portal for ease of management.

Conclusion

India has also established strong bilateral and multilateral collaborations and initiatives with CEBPOL - Centre for Biodiversity Policy and Law, India, ASEAN, UNEP-GEF, India-UNDP, CBD-COP 11, among others. In addition, India has established two databases, namely, Expert and Endemic databases, that aid researchers and scientists to identify relevant resource persons based on their expertise. Kenya looks forward to collaborate with India in the management of biodiversity under the Rio ‘92 agreement and the Access to Benefit Sharing (ABS), as envisaged in the Nagoya Protocol.

The following are the areas of interest that Kenya would be willing to engage moving forward with possible support and linkages through India’s Technical and Economic Cooperation (ITEC), Research Information System for Developing Countries (RIS) and other stakeholders working under the Access to Benefit Sharing (ABS) and the Nagoya Protocol:

- Under the CEBPOL Kenya’s resource persons responsible for collecting, collating, analyzing and disseminating information relating to biodiversity policy and law would be trained through establishment of appropriate linkages with NACOSTI Kenya;
- Under UN-GEF, development of tools, methodologies, guidelines, capacity-building for strengthening frameworks for implementing ABS provisions of the Biological Diversity Act;

- Establishment of collaboration between NACOSTI and NBA for strategic, programmatic, institutional and long-term cooperation on biodiversity related issues.
- Establishment of India and Kenya partnership to strengthen institutional structures involved in the implementation of the Biodiversity Act, resulting in behavioral changes in managing natural resources in an integrated, participatory and sustainable manner.

Endnotes

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- ³ Kenya Forestry Service
- ⁴ Kenya Plant and Health Inspectorate Service
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Technical Assistance from International Partners in Improving Veterinary System of the Kyrgyz Republic



Cholpon Bekbolot Kyzy*

Introduction

An ancient proverb is: “The doctor heals a man, and the veterinarian - mankind.” The role of the veterinary system is important – it provides animal health, food safety for animal origin products, and consequently human health.

Veterinary medicine is the branch of medicine dealing with prevention, diagnosis, and treatment of disease, disorder and injury in animals. This covers all animal species, domesticated and wild, with a wide range of conditions that can affect different species.

The veterinary science improves human health through monitoring and control of zoonotic diseases (infectious disease transmitted from animals to humans) and food safety, and indirectly through human applications from basic medical research. Veterinary scientists often collaborate with epidemiologists, and other health or natural scientists depending on the type of work.

The veterinary medicine has roots since ancient times. The Egyptian Papyrus of Kahun (Twelfth Dynasty of Egypt) is its first extant record. The Shalihotra Samhita, dating from the time of Ashoka, is an early Indian veterinary treatise. The edicts of Asoka read: “Everywhere King Piyadasi made two kinds of medicine available, medicine for people and medicine for animals. Where there were no healing herbs for people and animals, he ordered that they be bought and planted.”

The paper discusses the importance of international technical assistance in improving veterinary system in Kyrgyz Republic

* *Leading Specialist, State Inspectorate on Veterinary and Phytosanitary Security, Kyrgyzstan*

General Information

In accordance with the Article 4 of the Veterinary Law of the Kyrgyz Republic of 30 December 2014 No. 175, the Veterinary System of the Kyrgyz Republic includes:

- 1) The Government of the Kyrgyz Republic;
- 2) the authorized state body for veterinary medicine;
- 3) local state administrations within their competence and bodies of local government bodies within the framework of delegated state powers;
- 4) the veterinary statutory body of the Kyrgyz Republic;
- 5) persons engaged in veterinary business in the manner prescribed by this Law.

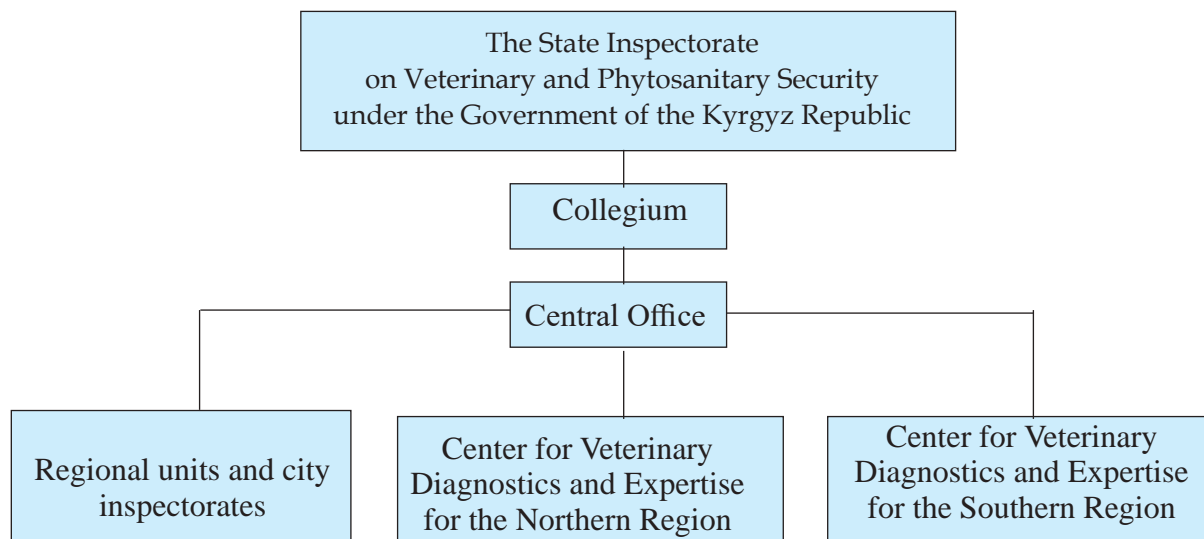
The Veterinary System has a mandate covering areas from farm to fork, and is established under the authority of the Prime Minister.

The central level includes units for animal health, veterinary public health, laboratory and border inspection.

In accordance with the Regulation of the State Inspectorate on Veterinary and Phytosanitary Security under the Government of the Kyrgyz Republic, approved by the Government Decree of the Kyrgyz Republic of 7 May 2013 No. 256, The State Inspectorate on Veterinary and Phytosanitary Security under the Government of the Kyrgyz Republic (hereinafter referred to as the State Inspectorate) is the state executive authority, exercising powers in the field of veterinary medicine and state supervision and control in the field of veterinary and phytosanitary security. The goal of the State Inspectorate is to supervise and control safety of life and health of people, animals and plants.

In Moscow, on 23 December 2014, Presidents of the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation, on the one hand, and the President of the Kyrgyz Republic, on the other hand, signed the Agreement on the Accession of the Kyrgyz Republic to the Eurasian economic union (EAEU). In connection with this event, the Government of the Kyrgyz Republic began to integrate veterinary system to the conditions of the EAEU.

Administration of the State Inspectorate on Veterinary and Phytosanitary Security under the Government of the Kyrgyz Republic



International Cooperation of the State Inspectorate

One of the activities of the State Inspectorate is international cooperation. The State Inspectorate starts active work on the interaction with State authorities of foreign States, international communities and international organizations for implementation of joint international projects to facilitate international agreements of the Kyrgyz Republic in the field of veterinary and phytosanitary security.

For the year 2017 to promote international cooperation following actions were taken

- Interactions with the communities of the CIS, SCO, CSTO, EAEC under the BOMCA; deliberative bodies and working groups; as well as within the international Government coordination commissions of trade-economic, scientific-technical and humanitarian cooperation;
- Compiling database of partner international organizations, identifying and exploring opportunities for joint projects, as well as the definition of contact employees, and worked out solution for issues that are of mutual concern ;
- Organized international meetings, prepared materials, selected venues, and took minutes of the meetings, more than 30 meetings were held;
- The execution of the law of the Kyrgyz Republic “about the interaction of State bodies in the sphere of foreign policy of the Kyrgyz Republic” dated 4 July 2012, No. 96. and details to the above-mentioned law, on a quarterly basis, appeared in the Ministry report in prescribed form on international activities, and also work plan GIVFB with PKR on the international cooperation for the next quarter;
- Systematized the work in cooperation with the Government Office, Ministry of Foreign Affairs of the Kyrgyz Republic, the IASC Secretariat and the Secretariat representative CD EEMA. Thus through the IASC secretariat Division of the Ministry of Economy of the

CD, information is available for the execution of the following items of inter-governmental commissions: Kyrgyz-Russian; Kyrgyz-Tajik; Kyrgyz-Turkish; Kyrgyz-Chinese; Kyrgyz-Uzbek; Kyrgyz-Kazakh; Kyrgyz-Indian; Kyrgyz-U.A.E.; Kyrgyz-KSA; Kyrgyz-Polish.

- Division staff also actively participate in the work of the State Inspectorate for the implementation of the action plan of the Government of the Kyrgyz Republic on the implementation of the action plan (road map) on the accession of the Kyrgyz Republic to a single economic space of the Republic of Belarus, Republic of Kazakhstan, the Republic of Armenia and the Russian Federation ,considering formation of the Eurasian Economic Union, approved the decision of the Supreme Council of the Eurasian Economic from 10 October 2014 year, No. 75.
- Since the beginning of the year, the Division, together with the staff of the specialized agencies in the field of veterinary and phytosanitary safety participated in more than 60 videoconferences on the SPS measures, technical regulations, TC; in joint discussions and meetings of study groups on the conclusion of agreements between China and Singapore, EEMA, Iran, Vietnam, in meetings under the Committee on the standardization of Technical Advisory Committee, and application of veterinary and phytosanitary measures on the safety of meat and fish products, etc.
- To determine the level of the Kyrgyz veterinary system for compliance with the standards and requirements of 4-score by the OIE, held from 26 June to 7 July 2017, a group of independent experts were invited for certification by the OIE to conduct PVS Pathway Mission of the OIE for laboratories. At present, the State is awaiting the results from the OIE experts' evaluation.
- Also, at the invitation of Prime Minister of the Kyrgyz Republic the Director General of the International Epizootic Bureau, Dr. Monique Eloi, was expected to visit the Kyrgyz Republic in the later half of 2018.
- Memorandum of understanding was signed between the State inspection on veterinary

and phytosanitary security of the Government of the Kyrgyz Republic and The General Directorate of quality control, inspection and quarantine of the People's Republic of China on cooperation in veterinary and phytosanitary measures.

- The FAO implemented a project to support establishment and functioning of Associations of private veterinarians CD. Currently, each District Association of CV also plans to create the Republican Association.
- The Japan International Cooperation Agency (JICA) launched a project on capacity-building veterinary CD, by organizing a two-week training course in Japan.
- Along the lines of the German Society for International Cooperation (GIZ), launched a project to develop computer software testing private veterinarians with the aim of assessing their qualifications during registration in the unified register of Veterinary Chamber.
- Within the framework of the FAO regional project on capacity-building of phytosanitary services of the Central Asian countries, technical assistance was given.
- Within the framework of the cooperation between the FAO and OIE, 2016, began developing a secondary strategy for the development of veterinary service of the Kyrgyz Republic till the year 2021.

Cooperation with the OIE

The World Organization for Animal Health (OIE) is an intergovernmental organization, responsible for animal health. It is a reference organization of the WTO, and comprised 181 member states in 2017. It develops and implements international standards for animal health, food safety and international trade rules. The CD is its member since 1992.

The State Inspectorate for Veterinary and Phytosanitary Security under the Government of the Kyrgyz Republic (hereinafter referred to as the "Gosinopektsiya") ,since the last 2 years has carried out intensive work to reform general system of the veterinary service.

The CD closely cooperates with the OIE on veterinary legislation. Amendments and additions to the Law of the Kyrgyz Republic "On Veterinary Medicine" were made on 24 May 2017 regarding delegation of certain state powers in veterinary medicine to persons entitled to veterinary practice (paragraph 3 of Article 6 of the Law) and determining competence of the Veterinary Chamber (Articles 23 and 24 of the Law) .

Based on the results of the PVS assessment of the OIE for identifying strengths and weaknesses of the Veterinary Service of the Kyrgyz Republic (February 2016), a draft Strategic Plan for the Development of the Veterinary Service of the Kyrgyz Republic has been developed till 2021. At present, this plan, after coordination with the relevant ministries and departments of the Kyrgyz Republic, has been submitted to the Government of the Kyrgyz Republic for approval. The laboratory evaluation of the OIE was carried out in June 2017,.

In accordance with the recommendations of the OIE, the veterinary laboratories of the republic are being optimized and laboratory specialists are being trained.

Of the existing 28, 19 laboratories would remain, 2 of them would have national level status (Bishkek, Osh) and would meet all requirements of the international standard. At present, veterinary laboratories in Bishkek and Osh have been repaired; and they are equipped with modern equipment worth \$ 2.6 million by the Russian grant (Stage 1). Till 2017, laboratory furniture was supplied (stage 2). And 24 laboratory specialists underwent specialized training in the Russian Federation on the basis of FGBU "VNIIZH".

Besides, 4 zonal veterinary laboratories are being built in the cities of Talas, Batken, Balykchy, Karakol and 12 inter-district veterinary laboratories are being repaired; for this in 2017, 175 million soms were allocated from the republican budget.

In addition, active work is being carried out in controlling transboundary diseases. The State Forest Research Committee has developed a

strategy for combating foot-and-mouth disease, and has issued a dossier and sent it to the OIE to receive the CD status of a free zone from foot-and-mouth disease with vaccination.

The first CIS space was created by the Veterinary Statuary Authority, a non-profit organization operating on the principles of self-government and regulating private veterinary practices in the country (hereafter - the Veterinary Chamber). The success of the activities of the Veterinary Chamber is obvious, in 2015, there were 1500 veterinary specialists registered, and on 14 October 2017, there were 2,439 specialists

To ensure high quality and efficiency of biologics, technical specifications for each type of purchased products was developed and approved in accordance with the requirements of the international standards. Thus, only high-quality and highly effective veterinary drugs were certified; confirmed by certificates of compliance of the OIE reference laboratories.

The National control strategies for eight especially dangerous animal diseases have been developed and agreed with the OIE.

To implement animal identification and tracking system in time, 180 animal identification trainers were trained, and more than 3,000 veterinarians and operators were also trained. Laptops, computers and smartphones have been delivered and installed.

Temporary containers for the placement of border veterinary checkpoints have been installed to equip border veterinary checkpoints across borders of Torugart, Erkeshtam, Dostuk, the Kara-Suu railway crossing point, and at the Osh international airport.

All 15 points of border veterinary control are in accordance with the requirements of the EAEU. This automated information system would be integrated into the systems of the EEA member countries.

With the help of the OIE experts, the evaluation of training programmes and postgraduate education of veterinary specialists was carried out. More than 30 training modules have been

developed, trainers have been trained, and veterinary specialists are also regularly trained.

Implementation of the “BOMCA-9”

State Inspection has been cooperating since the beginning of the BOMCA / CADAP programme, as it is the target beneficiary of the European Union Border Management Assistance Programme in Central Asia (BOMCA-9). In the earlier years, study visits were organized and seminars were held in the countries of the Central Asia and the European Union; computers and other equipment for the veterinary service were also purchased.

Currently, the 9th phase of the BOMCA programme is being implemented.

To improve cooperation and exchange of information between border, customs and other state control bodies, the concept and principles of integrated border management (CGS) have been introduced within the programme framework.

The activities planned for the implementation of the European Union Border Management Assistance Programme in Central Asia (BOMCA-9) in Kyrgyzstan for 2017 was planned as follows:

- A seminar/training on human resources management, financial planning and control was held on 16-18 May 2016 for the purpose of which professional development of employees of personnel and financial departments was considered. Three specialists from the State Inspectorate participated.
- A technical meeting was held on the anti-corruption analysis and updating of action plans for the search for corruption manifestations at the State Inspectorate on 03-07 October 2016. Two specialists from the State Inspectorate were participants.

The National Seminar on Interagency Cooperation was held on 19-21 April 2017 with the aim of optimizing cooperation between border agencies, expanding network of information exchange, providing information on international practices, and assisting in the development of legal instruments. Three specialists participated from the State Inspectorate.

Within the framework of the Border Management Programme in Central Asia (BOMCA9), EU experts have developed recommendations for inclusion in the updated Implementation Plan for the CGYG Strategy, which is based on the proposed structure of the Implementation Plan for the CUGB Strategy, and on an analysis of strategic documents for the development of border agencies on the information received during meetings with the representatives of the border agencies; the evaluation was carried out at the beginning of the project, and was also based on the experience of the EU countries on Dren systems of state border management.

Conclusion

The role of international cooperation in improving veterinary system of the Kyrgyz Republic cannot be underestimated. Kyrgyz Republic's case can be illustrative in this regard. At the contemporary stage of the development, Kyrgyz Republic pays enormous attention enabling international cooperation to strengthen partnerships with veterinary state bodies of foreign countries and international organizations (OIE, FAO, WHO, WTO, IPPC, EAEC, IAEA, BOMCA). The

technical assistance of the mentioned international organizations makes an inordinate contribution to the development of the veterinary system of the Kyrgyz Republic. Due to technical and financial assistance of the international partners, timely and qualitative, institutional and infrastructural reforms have taken place.

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Science Diplomacy for Kyrgyz-Indian Trade: Economic and Scientific-Technical Cooperation



Siuita Attokurova*

Introduction

India-Kyrgyz Republic bilateral relations

Historically, India has had close contacts with Central Asia, especially countries which were part of the Ancient Silk Route, including Kyrgyzstan. During the Soviet era, India and the then Kyrgyz Republic had limited political, economic and cultural contacts. Former Prime Minister Rajiv Gandhi visited Bishkek and Issyk-Kul lake in 1985. Since the independence of Kyrgyz Republic on 31 August 1991, India has been among the first to establish diplomatic relations on 18 March 1992, and the resident Mission of India was set up on 23 May 1994. At the institutional level on 27 April 2016 the 8th round of Foreign Office Consultation Was held on Bishkek.

Shanghai Cooperation Organisation

During its Council of Heads of State Meeting in Ufa, Russia, in July 2015, the Shanghai Cooperation Organisation (SCO) announced its decision to initiate India's membership. Prime Minister addressed the SCO Plenary Session. Gen. Dr. V.K. Singh, Minister of State for External Affairs, attended the SCO meeting of the Heads of Government, held on 15 December 2015 in Zhengzhou, China. During the year, representatives from India attended different ministerial meetings and the meeting of SCO Prosecutors General concerning health, interior, justice, trade and commerce.

* Researcher, Naryn State University, Kyrgyzstan

Status of bilateral trade and investment

(A) Two-way trade (goods)

1.1.1. According to the Kyrgyz side, the trade turnover is given in Table 1.1.

1.1.2 The data relating to trade in goods, in accordance with the information of the Directorate General for Commercial Information and Statistics (DGCIS) of the Government of India, is as follows (Table 1.2).

India-Kyrgyzstan Joint Statement during the State visit of President of Kyrgyzstan to India

His Excellency Mr. Almazbek Atambayev, the President of the Kyrgyz Republic, paid a State Visit to India from 18-21 December 2016. The official programme included ceremonial reception at Rashtrapati Bhavan, and meetings with President Shri Pranab Mukherjee, Vice President Shri M. Hamid Ansari and Prime Minister Shri Narendra Modi; a Banquet hosted by President Shri Pranab Mukherjee; and, participation in an India and Kyrgyz Republic Business Forum.

Table 1.1: Status of Bilateral Trade - Kyrgyzstan and India ((Million US\$))

Years	Export from India to Kyrgyzstan	Import from Kyrgyzstan to India	Total trade turnover	Trade balance
2012-2013	34.99	2.09	37.08	32.90
2013-2014	34.54	0.64	35.18	33.90
2014-2015	37.76	0.77	38.53	36.99
2015-2016	25.11	1.79	26.90	23.32
2016-2017 (April-Sept) *	14.70	0.38	15.08	14.32

Source: DGCIS, Kolkata, * preliminary

Table 1.2: Status of Bilateral Trade - Kyrgyzstan and India ((Million US\$))

Years	Export from Kyrgyzstan to India	Import from India to Kyrgyzstan	Total trade turnover	Trade balance
2011	18,3	28,3	46,6	20,0
2012	0,5	29,3	29,8	28,8
2013	0,7	26,3	27,0	25,6
2014	2,6	25,2	27,8	22,6
2015	1,2	22,7	23,9	21,5
9 months 2016	0,5	15,5	16,0	15,0

Prime Minister Modi and President Atambayev held a fruitful exchange of views in a warm and friendly environment, and discussed the full range of issues, covering friendly cooperation, bilateral relations, and the regional and international situation. The leaders reviewed the status of the agreements reached by two countries following the visit of Prime Minister Modi to Kyrgyzstan in 2015, and expressed satisfaction with the achievements in bilateral relations and reaffirmed their readiness to enhance further multifaceted cooperation.

Guided by the common desire to improve the level of the Kyrgyz-Indian relations, the two sides reiterated that India and the Kyrgyz Republic are democratic countries and are partners sharing common fundamental values such as freedom, democracy, human rights, and the rule of law.

Bilateral Relations

The leaders noted that the peoples of the Republic of India and the Kyrgyz Republic have historic and cultural ties since time immemorial, and

expressed satisfaction at the upward trend in broadening these ties since the establishment of diplomatic relations between the two countries 25 years ago.

Reaffirming their commitment to strengthen cooperation in all spheres of life on the basis of mutual respect, the two sides agreed to work in close cooperation for peace and prosperity of their people. The Indian side appreciated the successful and transparent conduct of parliamentary elections with the use of biometric data in the Kyrgyz Republic in October 2015.

India and Kyrgyzstan underlined the value of Parliamentary exchanges. The Indian side offered to share their experience during special courses which were arranged for the members and staff of the Parliament of the Kyrgyz Republic. The Kyrgyz side appreciated this special gesture of the Indian side.

The two sides expressed satisfaction over the effective implementation of the Memorandum of Understanding on cooperation on electoral matters between the Central Commission for Elections and Referenda in the Kyrgyz Republic and the Election Commission of India, which was signed in July 2015.

The Kyrgyz side appreciated India's role as a partner in development. Both sides took note of projects under implementation as also those in the pipeline in diverse fields, including information technology, health care, telemedicine, agriculture, biomedical research, training and capacity building, education and culture.

To celebrate the 25th anniversary of establishment of diplomatic relations between the two countries, the two leaders agreed to hold a series of events to commemorate the occasion.

Cooperation in the field of Defence

The two sides expressed satisfaction with the development of cooperation in defence sphere, which reflects high level of mutual trust between the two.

Three IT-Centres have been established by India since the two years at Kyrgyz Military Institutions, and an IT Centre has been upgraded.

"Khanjar" series of the India-Kyrgyzstan military exercises have become an annual event; "Khanjar-II" exercises were held in March 2015 in Kyrgyzstan; "Khanjar III" in March-April 2016 in Gwalior, India, and The "Khanjar-IV" were held in Kyrgyzstan in February-March 2017.

The third Joint India-Kyrgyz Army Mountaineering Expedition was conducted in August-September 2016. A joint team comprising 19 officers and soldiers climbed JOGIN-III peak at a height of 6113 metres above sea level in the Central Himalayas in India. Earlier expeditions had scaled the peak of Stock Kangri in Ladakh (September 2011) and Lenin Peak in Kyrgyzstan (3-25 August 2013).

India and Kyrgyzstan are constructing jointly the Kyrgyz-Indian Mountain Training Centre in the city of Balykchi in Issyk-Kul District of Kyrgyzstan. This Centre would be providing instructions and training for personnel of the Armed Forces of the Kyrgyz Republic, as well as host joint Kyrgyz and India mountain-training exercises.

The Kyrgyz side appreciated Indian side for support and assistance in equipping Kyrgyz Military Field 2nd Level Hospital for UN Peacekeeping Missions, and welcomed offer of assistance in training.

Economic Cooperation

The two sides noted that the current level of trade and investment relations between them are below the available potential, and directed that Ministries and Departments of the two countries shall develop a comprehensive Road-Map in this area for a five-year timeframe. The two countries have agreed to explore new mechanisms to further strengthen economic ties between them. Both were satisfied with the Bilateral Investment Treaty initiated on 20 December 2016.

The two sides noted the success of the 8th meeting of the Kyrgyz-Indian Intergovernmental

Commission (IGC) on Trade, Economic, Scientific, Technological and Cultural Cooperation, held in Bishkek on 27-28 November 2016. The leaders directed the IGC to strengthen implementation of bilateral agreements, including holding regular meetings in the framework of different Joint Working Groups on sectoral issues.

And both expressed satisfaction over the progress achieved in agriculture, envisaging *inter alia* university to university cooperation; setting up of a demonstration unit for drip irrigation; and promoting export of dry fruits, honey and walnuts from the Kyrgyz Republic to India. The Kyrgyz side welcomed assistance of Indian side in establishing aromatic industry and consultancy in organic farming. There has been increased flow of tourists between the two countries, in particular, after the opening of direct flights from New Delhi to Bishkek, with working towards effective visa facilitation.

As part of the discussions on the integration process in the Eurasian space, the Kyrgyz side highlighted opportunities available for the Indian entrepreneurs as a result of their joining Eurasian Economic Union (EaEU). The two sides noted progress in work of the Joint Study Group considering feasibility of a Free Trade Agreement between India and the Eurasian Economic Union.

And cargo movement on the International North-South Transport Corridor (INSTC) would be a significant step in solving logistics issues, and would give a fillip to India-Kyrgyzstan trade relations. As member- states of the INSTC both sides agreed to jointly operationalize cargo movement on the INSTC. They together agreed that the Chahbahar Port in Iran would provide the shortest connectivity for Kyrgyzstan to warm waters and to India.

Scientific, technical, cultural cooperation as well as people-to-people contact

The Indian side highly appreciated the support extended by the Kyrgyz Republic to the Kyrgyz-India Mountain Bio-Medical Research Centre. The two sides were satisfied with the successful

completion of the Second Phase Laboratory at the Suez High Pass and conducted tests in November and December 2017. They agreed to continue collaboration in research and development in this field and to expand scope of research.

President Atambayev highly praised India's contribution in setting up a Telemedicine Network in Kyrgyzstan and its expansion in the remaining regions of Kyrgyzstan. There are growing successful links between private hospitals in the health sector, including regular visits by doctors from specialized hospitals in India to Kyrgyzstan.

And Kyrgyzstan remains a popular destination for Indian students for pursuing medical education.

Over 1,100 professionals working in the state structures of Kyrgyzstan were trained under the Indian Technical and Economic Cooperation (ITEC) programme. The Kyrgyz side welcomed the decision of the Government of India to continue to support experts from Kyrgyzstan within the ITEC framework.

The Indian side expressed gratitude to the Kyrgyz side for full support extended for the celebration of the second International Yoga Day. The Kyrgyz side appreciated India for setting up an AYUSH Center (Center of Ayurveda, Yoga, Naturopathy, Unani, Siddha and Homeopathy) in the Kyrgyz Republic to offer consultation and instruction in Traditional Indian medicine, and the Centre also arranges yoga camps for instructors from all over Kyrgyzstan.

Prime Minister Modi congratulated President Atambayev over the successful conclusion of the Year of History and Culture, and the Second World Nomad Games in Kyrgyzstan. President Atambayev thanked Prime Minister Modi for India's whole-hearted participation in cultural activities of Kyrgyzstan, including in the World Nomad Games.

The leaders noted with satisfaction staging of the play based on the epic "Mahabharat" in the Kyrgyz language at the Kyrgyz National Drama Theatre; the Festival of India in Kyrgyzstan; participation by the Indian artists in the

handicrafts fair, “Oimo”; and the publication of the autobiography of Mahatma Gandhi in the Kyrgyz language. During his visit, the first copy of heroic epic of the Kyrgyz people “Manas-Semetei-Seitek” in Hindi was presented to Prime Minister Modi by President Atambayev. The first copy of a collection of Indian poems in the Kyrgyz language, “Colours of Life” was presented to President Atambayev by Prime Minister Modi.

Cooperation at Regional and Global Levels

Noting the similarity of both the countries on many important international issues, the two sides stressed importance of deepening cooperation between India and Kyrgyzstan in the international arena, including in the framework of the United Nations and reaffirmed the need to strengthen the role of the UN.

Noting the contribution of India in maintaining peace in the world, the Kyrgyz side reiterated support for the rightful claim of India for Permanent Membership in an expanded UN Security Council. The Indian side thanked the Kyrgyz side for their consistent reiteration.

The Kyrgyz side appreciated the Indian side for active support to the Kyrgyz Republic for election to the UN Human Rights Council for the term 2016-2018. The Kyrgyz side welcomed imminent full membership of India in the Shanghai Cooperation Organisation (SCO).

The two leaders noted the challenges posed by terrorism and extremism in the world, as well as on the Asian continent, and emphasized ensuring a stable and secure environment for peaceful economic development. In this context, they also called for the adoption by the United Nations of the draft Comprehensive Convention on Combating International Terrorism.

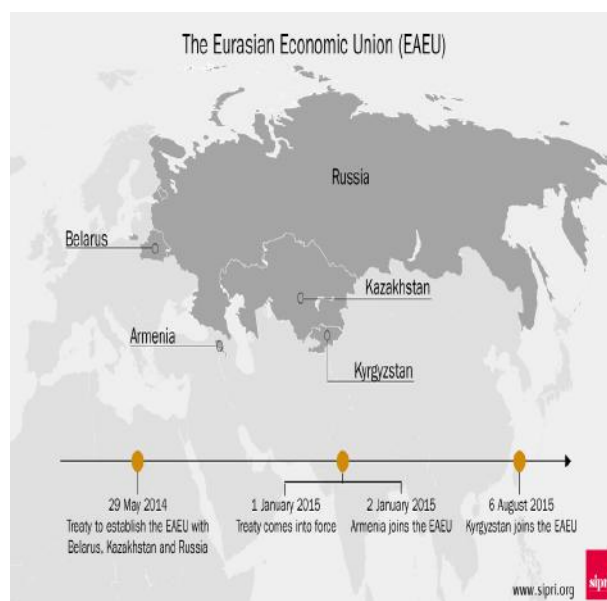
The two side leaders welcomed ratification of the Paris Agreement of the UNFCCC by number of countries, including India, which contributed to its entry into force on 4 November 2016. It was emphasized that the agreement should continue to be guided by the principles of the UN Framework Convention on Climate Change

(UNFCCC), especially the principle of Common but Differentiated Responsibilities (CBDR), and emphasized the need for the Annex II countries to fulfil their pre-2020 obligations. They underlined the importance of using renewable sources of energy for combating climate change.

Highlighting the importance of protecting vulnerable and fragile ecosystems and rare and disappearing species, and the Kyrgyz side organized a Summit on Protection of Snow Leopards in September 2017.

Eurasian Economic Union policies and practice in Kyrgyzstan

Kyrgyzstan’s experience as a member of the Eurasian Economic Union (EAEU) from mid-2015 to late 2016 has been disappointing. While favourable employment conditions have been created for Kyrgyz labour migrants, the anticipated increased access to markets of the EAEU member states and large-scale capital investments are still to be materialized. The prospects for Kyrgyzstan’s membership of the EAEU may become more favourable in a short term, but this would depend if the EAEU functions are as envisaged. Kyrgyzstan’s membership of the EAEU would serve as a testing ground to explore effectiveness of the group and scope for future expansion, as well as the capacity of the Kyrgyz Government to navigate this multilateral structure.



While facing EAEU inefficiencies, China has become the primary creditor of Kyrgyzstan in the recent years. Even though imports and subsequent re-export opportunities have diminished, China's role in funding large-scale infrastructure projects through direct lending to the Kyrgyz Government, as well as foreign direct investment (FDI) and regional initiatives, is expected to increase its importance.

Kyrgyzstan before and after joining the EAEU

After becoming a member of the World Trade Organization (WTO) in 1998, Kyrgyzstan adopted a liberal trade regime. This gave it the benefit from massive re-exports of Chinese goods to neighbouring countries and Russia. Within this framework, the trade sector became a driver of economic growth and a source of employment for about 15 per cent of the Kyrgyz labour force. Following its decision to join the EAEU, it became clear that this re-export activity would cease, given the anticipated end of the differential in import tariffs.

Initially, there was some opposition to joining the EAEU within Kyrgyzstan, particularly from some officials, business organizations and non-governmental organizations (NGOs). They argued that membership would make Kyrgyzstan dependent on Russia not only economically, but politically also. Despite these misgivings, President Almazbek Atambaev and the Kyrgyz Government signed the EAEU membership agreement on May 2015. Kyrgyz officials argued that joining the EAEU was not only the only viable option, but also a highly promising one for development. In this way, they raised public expectations too high. On accession to the EAEU, Kyrgyzstan became the fifth member along with Armenia, Belarus, Kazakhstan and Russia. However, this coincided with a sharp decline in oil prices and imposition of economic sanctions on Russia, which contributed to depreciation of the Kyrgyz currency and contraction of its economy. These events affected Kyrgyzstan's trade, remittances and investment inflows.

The five member states of the Eurasian Economic Union (EAEU) as of June 2017 are Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia.

Currency appreciation and depreciation

The less discussed feature of this period is the appreciation of the Kyrgyz Som against Russian Rouble and the Kazakh Tenge, which induced an increase in imports of goods from EAEU member-states. Kazakhstan's Central Bank depreciated Tenge to maintain its previous parity with Rouble, but the Kyrgyz National Bank did not follow suit. It intervened heavily to keep national currency strong for fear of harming its highly dollarized economy.

Therefore, instead of exporting its agricultural products, Kyrgyz producers suddenly faced competition from Kazakh, Russian and Belorussian companies in its domestic market. This created public disillusion with the Kyrgyzstan Government's decision to join the EAEU, even though the exchange rate developments were not directly connected to integration efforts. These negative sentiments have intensified with the continued struggles of agricultural exporters, whose exports have been banned by both Kazakh and Russian regulatory bodies on the grounds of food quality and safety. A further frustration is Russia's inability to continue with the construction of a hydroelectric station, which resulted in the termination of the agreement. In all these cases, the reality has not lived up to the expectations.

Among the more positive developments, labour migration statistics show that as of 2016, more than 25 per cent of Kyrgyzstan's total workforce was employed in Russia. Remittances account for 30 per cent of Kyrgyzstan's total gross domestic product, and over 90 per cent came from Russia. Between 2015 and 2016, the inflow of remittances increased by 22 per cent to USD \$1.6 billion. These figures contrast with Uzbekistan and Tajikistan, which witnessed a reduction in the number of labour migrants in Russia combined with an ongoing decline in remittances. It may be assumed that Kyrgyz labour migrants also

possess more formal rights and fewer restrictions on employment in the EAEU countries; although there is no evidence to confirm this assertion.

Another advantageous trend is visible in the Kyrgyz-Russian Development Fund, established in November 2014 with USD \$500 million, which aims to boost investment in Kyrgyzstan. The fund increased its level of activity in 2016 by crediting private sector and promoting import-substitution sectors of the economy, such as agriculture, food processing, construction and textiles. By the end of 2016, the fund had extended loans of USD \$175 million, but the total effect of these loans and investments is yet to be fully evaluated.

The increasing role of China

Russia has a strong footprint in Kyrgyzstan, but China's role as a development actor and investor in Kyrgyzstan has been growing exponentially in the recent years. China became a major donor by funding large infrastructure and energy projects and providing budget support. Prominent projects funded by China include USD \$389 million for the Datka-Kemin energy transmission line, USD \$386 million for reconstruction of a Bishkek energy company and USD \$400 million for construction of the Bishkek-Torugart road, as well as construction of an alternative route linking the north and south of the country.

The extent of such projects is likely to grow. The Export-Import Bank of China became Kyrgyzstan's largest creditor in 2016. It has outstanding credits of USD \$1.3 billion, which accounts for almost 40 per cent of external public debt. There is also growing interest from public and private Chinese companies in FDI in the energy, airline and construction sectors to access the EAEU market. Given the expansive nature of these, albeit nascent trends, China is poised to rewrite the rules and alter domestic attitudes to FDI and infrastructure development in Kyrgyzstan.

Overall, it is difficult to assess the benefits of Kyrgyzstan's accession to the EAEU, as its membership has coincided with regional economic and political shocks. The economic prospects for Kyrgyzstan as an EAEU member

may be favourable, but it must fulfil outstanding requirements of EAEU membership. In the meantime, China is clearly increasing its strategic and economic interests in Kyrgyzstan, leading to questions over how the latter would balance its longer-term cooperation with Russia.

India EAEU FTA – FICCI Survey Report

The EAEU, comprising Russia, Belarus, Kazakhstan, Kyrgyz Republic and Armenia, established in 2015, could emerge as a prospective partner for India which have had limited trade with the CIS countries.

Currently, bilateral trade between India and EAEU is around \$9 billion, and was at \$11 billion at its peak in 2012-2014. *"Supported by the modern instruments of trade policy, the trade could grow significantly,"* - Veronika Nikishina, Board Member and Minister for Trade of the Eurasian Economic Commission (EEC). According to her, Belarus would benefit the most with the potential of trade growth with India up by 20 per cent, followed by Russia (18 per cent) and Kazakhstan (12 per cent). For EAEU as well as for India, the potential export growth is estimated to be at around 18 per cent once the FTA is in place.

The Joint Feasibility Study Group report published earlier this year showed a potential growth of bilateral trade between India and EAEU up to \$37-62 billion. The exports from the EAEU to India have the potential of additional growth up to \$23-38 billion while in case of exports from India to the EAEU, there would be potential additional growth of \$14-24 billion

FTA between India and EAEU

The FICCI has performed a perception survey on India Eurasia Relations, on various aspects of trade relations between India and the EAEU countries.

The raison d'être for the FTA Survey is to ascertain interest areas, issues faced, factors hindering trade and investment and what could be the key items which should form part of the 'negative' list for imports and items to be promoted for better market access.

Conclusion

According to the Dr Nina Federoff, Science and Technology Adviser to US Secretary of State, 'Science diplomacy is the use of scientific interactions among nations to address the common problems facing humanity and to build constructive, knowledge based international partnerships.' The role of India's science diplomacy for Kyrgyz Republic is essential in terms of cooperating in space of science, innovation, technology, industry, human building capacity, etc

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Science Diplomacy for Enhancing India and Mongolia Bilateral Relations



Bat Amgalan Turbat*

Historic Overview

India and Mongolia have been historically interacting over a period of 2600 years. Following the emergence of Mongolia as a modern nation state in the 20th century, the two countries have continued to build relations based on the shared historical and cultural legacy. The roots of the relations are based on the ancient literature, languages, medicine, folklores, religions, especially Buddhism, social and cultural traditions. Buddhism was the first bridge connecting India and Mongolia in the Hun period of 3rd century. Mongolia was one of the countries which participated in the First Asian Relations Conference, held under Jawaharlal Nehru's initiative in March 1947.

Political Relations

Diplomatic Relations and Bilateral Cooperation Mechanism

Diplomatic relations between India and Mongolia were established on 24 December 1955. India was the first country outside the Socialist bloc to establish diplomatic relations with Mongolia. India supported Mongolia in becoming a member of UN and Non-Aligned Movement (NAM) memberships. By now the diplomatic relations between both the countries are more than six decades old. Many dignitaries from India had visited Mongolia over the years.

Most recently in May 2015, Sri Narendra Modi, the Prime Minister of India visited Mongolia. In fact he was the first Prime Minister from India to visit Mongolia. On that occasion India announced a US\$ 1 billion line of credit (LoC) for enhancing Mongolia's economic capacity and infrastructure and to take forward the current bilateral relationship into one of strategic partnership.

* Chief Editor of *Pax Mongolia, Institute of International Affairs, Mongolia*

The visit of Indian Prime Minister resulted in signing of 13 agreements. India and Mongolia have established 'India-Mongolia Joint Committee on Cooperation (IMJCC). IMJCC is chaired by Minister of State (EA) on the Indian side and Minister of Education & Science from Mongolia. In the fifth meeting held in April 2016 a general agreement was signed between the EXIM Bank of India and the Ministry of Finance of Mongolia on utilization of the soft loan announced by PM.

International Cooperation

Mongolia has traditionally been extending support to India in UN and other international for including India's claim for a seat in UN Security Council. Besides these, Mongolia had supported almost all the candidates from India proposed for various UN agencies. Mongolia voted in favour India's proposal to include Yoga in the list of UNESCO's Intangible Cultural Heritage. Mongolia had publicly reaffirmed its support for India's membership to the permanent seat of expanded UNSC.

Bilateral Cooperation in Science and Education Sectors

ITEC On the occasion of President Elbegdorj's visit to India, 120 slots per annum were allotted to Mongolia under the Indian Technical and Economic Cooperation (ITEC). The number of these slots for civilian training programme increased to 150 per year in 2011-12. It was further increased to 200 from 2015-16 during PM's visit in May 2015. But utilization had not been satisfactory. In 2016-17, out of the 200 ITEC slots allotted to Mongolia, only 100 were utilized, and in defence sector, only seven out of 14 ITEC seats were utilized.

ICCR Scholarships: In 2016-17, Mongolia 40 slots (20 slots each under Aid to Mongolia and General Cultural Scholarship Scheme) were offered and 13 candidates got admitted to different universities in India.

Rajiv Gandhi Polytechnic College for Production and Art (RGPCPA): This was proposed in 1992 as an institution to train in eight

fields. Over the years the facilities have been upgraded at a cost of US \$ 2.84 million.

Atal Bihari Vajpayee Centre for Excellence in ICT: The Atal Bihari Vajpayee Centre of Excellence (ABVCE) in Information and Communication Technology (ICT) and five Community Information Centres (CICs) in five provinces (Khovsgol, Bulgan, Kharkhorin, Darkhan-Uul and Sukhbaatar) were established on the basis of agreement signed in 2001. Upgradation as a full-fledged Centre is in progress, with credit of US\$ 20 million.

Solar Energy: In 2006, Central Electronics Ltd set up a solar energy electrification project that was executed by the Central Electronics Ltd, in Dadal Soum, and cost of project is approx. US\$ 100,000. Training of Mongolian experts on solar energy was provided in India.

Conclusion

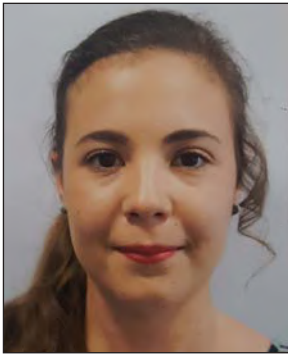
For Mongolia, India is an important strategic partner under its 'Third Neighbour Policy' so as to maintain geopolitical balance among its neighbouring countries. This should pave way for more collaboration between these two countries. Sectors like education, cyber security, health, tourism, food processing and processing of minerals provide ample scope to collaborate and such collaborations should include private sector also in a significant way. In fact, strengthening collaboration in higher education and capacity building in S&T will be mutually beneficial. The science diplomacy can play a key role in this.

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An Overview to the Inclusiveness of Science in Diplomacy within the Indian Ocean Economy



Daniëlla Labuschagne Smit*

Introduction

“Diplomacy is more than saying or doing the right thing at the right time; it is avoiding saying or doing the wrong things at any time” – Bo Bennett

On the diplomatic level, the 21st century provides nations a critical arena characterized by economic and regional challenges which force traditional diplomatic practices to new spheres, which are more flexible and effective in the ever -growing international environment. These new spheres are notably affected by internal legislation, internationalization, and the transfer of technology and innovation. New instruments, such as corporate and business diplomacy, which are a common use on land, have moved to a new dimension known as the ‘Blue Economy’ (BE) or as ‘Blue Diplomacy’ (BD).

Over the past decade, the BE gained a lot of attention in terms of increasing strategy to global, regional and national negotiations. This developing sector has led to the basis of effective and efficient policies and treaties harnessing potential of government and private sector entities. The wide range of opportunities, that BE offers can contribute in boosting economic development and growth within various sectors. Ocean resources are not infinite being exploited at a significantly higher rate, would impact island nation states, the marine environment and coastal areas. Overexploitation of ocean resources is not the only cause of diplomatic intolerance, but impacts of climate change are also

putting tremendous pressure on both marine and terrestrial environments through extreme weather, which would in all likelihood increase natural disasters. Governments are constantly developing policy measures, having negotiations with regional groupings and global entities to address these challenges to ensure sustainable approach for the future generations.

Small Island Developing States (SIDS) are most vulnerable to climate change-driven disturbances; with millions of people threatened by natural disasters such as flooding, storm surges, erosion and other coastal hazards. Therefore, there is a need for Science Diplomacy and international collaboration to address these challenges. In addition, the need for improved disaster risk reduction measures and actions are also highlighted, which are essential for the management, prevention and improvement of land environment management.

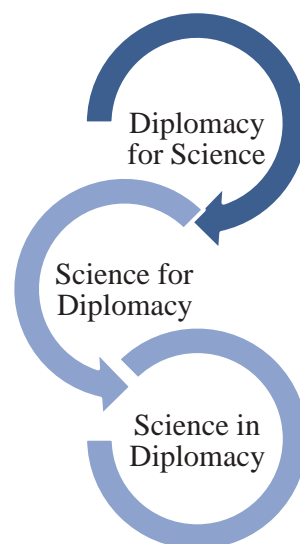
The use and integration of science to policy developments have become an essential focus and key for diplomats in effective decision-making and negotiations. Taking into consideration the current economic crisis and evolving political, social and environmental conditions within the IOR, there is a need to put together multidisciplinary actors from different countries and entities to ensure an ideal environment for the SD. Not only would this act as a 'global diplomatic bridge' but would also enable creation of an inclusive approach for societies, economic developments and sound policies for environmental conservation and cooperation among nations.

Science Diplomacy

It is vital to understand conceptual framework of the SD as a global trend to international collaboration in research and development among many industries. Countries are facing many challenges in terms of economic, environmental and social developments, which are considered to be the key aspects to attain sustainable development policies and practises. The SD could, therefore, be described as the *gateway* to sustainable development goals through the use of scientific collaborations among nations to address

common problems and to build constructive and international partnerships. The implementation and recognition of this new term by diplomats would provide guidance to foreign policy objectives.

Figure 1: Types of Science Diplomacy



The above figure represents three different concepts of SD, based on the goals of the relationship of 'science' and 'diplomacy' issues. The SD is considered to guide and harness international scientific cooperation, including education, knowledge transfer, capacity-building and advanced technological developments through innovations. Therefore, diplomacy does not include only informal and formal relationships among countries, but it can also be used as an effective tool to harness developments and negotiations achieving Sustainable Development Goals (SDGs) by 2030.

SD for scientific collaborations among nations to address common problems and to build constructive international partnerships

In January 2010, the Royal Society noted that "science diplomacy" refers to following three main types of activities¹:

- Informing foreign policy objectives with scientific advice (science in diplomacy)
- Facilitating international science cooperation (diplomacy for science); and

- Using science cooperation to improve international relations between countries (science for diplomacy).

As an umbrella term covering a wide range of partners within different sectors, SD plays an essential role in the process by which states represent themselves and their interests in the international arena when it comes to areas of knowledge, its acquisition, utilisation and communication. This would lead to a developmental shift within diplomatic practises including three main entities for effective cooperation ; scientists, policy-makers and business community. Incorporating this approach to diplomatic decisions would reduce overall imbalances and act as a stepping stone to escalate sustainability for humanity and economic developments.

The Need for Science Diplomacy

As mentioned, SD forms a holistic pattern and roadmap to achieve different goals and objectives. The need for cooperation between diplomats and scientists on a larger multilateral programme is acknowledged as a key driver to global cooperation with science- based facts. According to the Food and Agriculture Organization, overexploitation of marine -based industries such as fisheries already face various challenges, especially extinction of some fish species. This is exactly where the impact and guidance to control illegal, unreported and unregulated (IUU) policies fall into place. Hence, diplomacy is a key facilitator to science, technology, research and development, and would act as an enabler to establish a full-fledged communication channel for negotiations which stretches beyond borders. The implementation of SD assists various nations to increase global and regional collaboration based on mutual areas of interest. This allows multiple actors and diplomats to build stronger inter-agency collaborations based on various facts and figures for foreign policy-makers.

Focusing on marine-based industries and the emergence of the BE paradigm, it becomes urgent to promote a '*Blue Diplomacy*' approach focusing on the service of sustainability for future generations. The need for SD to promote

reasonable, sustainable exploration and advanced technological developments for oceans is critical in the world we live in today.

The future requires intensified science, research and technological developments to foster a stronger civil society which would equip leaders with required information for effective foreign policy decisions based on a wide range of issues. Worldwide challenges such as climate change, use of atomic energy, decolonization, cybersecurity, ecological footprints and the human impact on the environment among others creates not only a need for SD, but indicates an urgency.

Blue Economy Architecture

Oceans are a major source of economic activity, and contribute to approximately 5 percent of the world's GDP. It is important to note that more than 70 percent of the earth is covered by water. Water is known for many centuries as the starting point for all life, including humanity. Not only is water a requirement for existence of life but it provides food security, energy resources, transport routes and employment opportunities.

The ocean and its resources are increasingly recognised as being indispensable for addressing multiple challenges that the planet would face in the decades to come. As mentioned by the Ocean Economy in 2030,² by the mid-century, enough food, jobs, energy, raw materials and economic growth would be required to sustain a predicted population between 9 and 10 billion people. Ocean has the potential to assist these requirements, and thus requirement is for a wide and substantial expansion of ocean- related economic activities. The questions arise – how would governments control development of sustainable economic related activities? How can the threats and the challenges be prevented related to climate change or over- exploitation of fisheries management and marine pollution? The questions are prominent and the answer is simple.

One Apparition – Science Diplomacy

As a relatively new term, the BE is a marine-based economic development that leads to improved human well-being and social equity

while significantly reducing environmental risks and ecological scarcities.³ This developmental paradigm contributes to ‘developmental spaces between ocean borders’ for the sustainable use of ocean resources, which are integrated into economic and foreign policy developments. As such, the BE concept is also a developing world initiative pioneered by the Small Island Developing States (SIDS), but is relevant to all coastal states and countries with an interest in waters beyond national jurisdiction. The SIDS have, therefore, remained at the forefront of BE advocacy, recognising that oceans have a major role to play in humanity’s future, and that the BE offers an approach to sustainable development better suited to their circumstances, constraints and challenges. As a developing industry, the BE plays a critical role within the IOR, since countries within this have vast maritime zones under their jurisdiction.

SIDS and the Blue Economy

The importance of marine and coastal resources to the SIDS is evident, and has been elaborated in numerous international fora. The BE, however,

offers potential for SIDS to alleviate one of their defining obstacles to sustainable development, namely that of a narrow resource base. The remarkable per capita marine resource area, enjoyed by the SIDS, especially the BE approach offers vast prospect to sustained, environmentally-sound and socially inclusive economic growth. The current global challenges and opportunities through Science and Technology (S&T) provide SIDS the opportunity to prepare and position themselves to realise optimal benefits for their sustainable development to the development of the ‘blue revolution’.

The benefits of the BE, however, are not exclusively tailored for the SIDS, they are equally applicable to coastal countries, and ultimately the BE approach offers means for sound utilization of resources beyond national jurisdiction. This allows countries to enhance sustainable development of the common heritage of humanity with a main focus on the ‘blue resources’ that oceans provide.

Blue Economy Components

The BE is considered to be the essential key for long-term sustainability of freshwater and

Figure 2: Components of the Blue Economy

Type of activity	Blue Economy Sectors
Harvesting of living aquatic resources (marine bio-technology, seafood, plant and marine organisms)	Fishing (inland, coastal and deep seas) Aquaculture Mari-Culture Pharmaceuticals, chemicals, cosmetics and genetic research
Extraction of non-living resources and generation of new energy resources	Deep-sea and seabed mining Offshore oil and gas exploration Renewable energy
Commerce and trade in and around the ocean and rivers	Maritime transport and port infrastructure and services River transport Tourism and recreation
Protection	Coastal protection Sustainable use of ocean resources (effective fisheries management strategies)
Knowledge and information sharing	Scientific, socio-economic and political research Marine Biotechnology
Cultural and religious views	Cultural and religious practises

Source: Author’s compilation.

coastal ocean spaces assisting health of oceans and freshwater resources, which are inextricably linked to long-term management, development and well-being. The importance of the BE needs to be highlighted in the IOR. The vast opportunity of the ocean acts as an important factor contributing to future 'employment creation platform' for public and private sectors. The ocean covers 72 percent of world's surface, and constitutes more than 95 percent of the biosphere, which is vital for the overall existence of mankind. With this important resource in mind, the BE approach is based on a vision of *"improved wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities"* (UNEP 2013).⁴

The overall aim of the development within the BE is to adopt strategies and policies which would promote decent livelihood and food security for communities. With a focus on the IOR, countries within the rim have the opportunity to tap on this source for economic growth, ensuring prosperity within the region. Economic sectors such as fisheries, marine aquaculture, seabed mining, coastal tourism, shipping, renewable energy, maritime safety and security, biotechnologies and port infrastructure developments, all fall under the critical developmental paradigm of the BE (Figure 2).

Oceans and inland water resources provide enormous investment opportunities and benefit humanity as a whole and create 'blue spaces' to ensure that these opportunities are utilized. Water resources include: fisheries, food and nutrition, economic and social well-being, marine and coastal tourism, mining opportunities; and are open for innovative approaches to renewable energy developments for a safer environmental approach. More than 40 percent of the global population lives within 100 km of coastal regions. Thirteen of the world's biggest business hub cities are located alongside the coastal regions. Overall, nearly 700 million people live in low-lying coastal areas, which are less than 10m above sea level, and are highly dependable on aquaculture and fisheries to sustain development of the region. The demand for ocean resources, jobs, renewable energy and economic growth would be required

in the future to upgrade well-being of the people in the IOR. This is a main focus area which needs to be addressed with appropriate policies and strategies to harness benefits of the Blue Economy concept⁵.

The investments and developments to enhance BE paradigm in terms of science and technology have transformed entire dimension and approach by diplomats formulating foreign policies. With reference to employment policies and incentives, around 58 million people are employed within fisheries and aquaculture industries alone and around 200 million people are harvesting benefit from direct and indirectly from employment opportunities, which are created by the developments in the value-chain of the industry. The importance of the fisheries and aquaculture industry is one of the most important sectors which are growing faster than traditional agricultural methods and have drawn attention from various countries within the region.

It is to be noted that technological developments have enabled undersea exploration. The growing demand of natural resources has put the fragile marine environment under tremendous stress. As a common global interest, SD plays a significant role in the development of the BE with nations through scientific data, assisting foreign policy decisions and government entities connecting society for the better while striving to achieve the SDGs.

The Indian Ocean serves major trade routes from Australia, much of Asia, the Middle East, the Atlantic and the Mozambique Channel, connecting to European markets. It is also a major oil shipment sea highway, which the US Energy Information Administration identifies as one of the global strategic chokepoints. Thus, the BE is not merely a dynamic business model of an ocean economy. The model is also dedicated to address the issue of scarcity of resources and waste issues while ensuring long-term economic prosperity. The BE hence embodied the key value of sustainable development goals, especially the goal number 14, 'Life below Water'. The Indian Ocean is blessed with vast and untapped natural resources but it also faces great threats and

What makes the BE different from a land-based economy industries?

Difference #1: The Ocean is much larger than land Implications: Natural marine processes, ecosystems and species are not confined to maritime legal boundaries. Different legal regimes apply to a single activity depending on where it takes place, even within the jurisdiction of a single coastal country (territorial waters, contiguous zone, economic exclusion zone), and is further compounded by the interests of other countries in areas beyond national jurisdiction (international waters).

Difference #2: Water is less transparent than air Implication: Remote sensing technology is not able to penetrate deep below the sea's surface. This makes it much harder and much more expensive to know what's going on in the water column and the seabed. Marine research and monitoring costs are extremely high, which helps explain why we know much less about what goes on in the ocean than about what happens on land.

Difference #3: The Ocean is more three-dimensional than land Implication: Marine life occurs from the sea surface down to the deepest ocean trench, while on land only comparatively few species (i.e. those with the ability to fly) can sustain themselves above the land surface. The same also applies, to a certain extent, to human activities. This renders two-dimensional maps less useful, and increases the complexity of marine spatial planning and management. It also makes it more difficult to study the marine environment, how it works, how it is affected by human activities (see difference #2), and how the ocean benefits the economy and human well-being.

Difference #4: The Ocean is fluid and interconnected. Implication: What happens in one place may affect what happens elsewhere, as pollutants and alien species are carried by ocean currents and/or vessels to much greater distances than on land.

Difference #5: Marine species can potentially travel much longer distances than terrestrial ones Implication: This makes the management of human activities that use marine resources particularly difficult, as they are accessible to almost anyone.

Difference #6: Aggregations or clusters of animals in the water column can shift rapidly from one location to another Implication: The mapping of these species and their movements is more difficult, and measures to protect or manage them need also to shift in time and space accordingly.

Difference #7: Nutrients and pollutants can be retained for several decades until they are returned by ocean circulation Implication: There can be significant time lags between the periods when certain human activities take place and the time when their impacts occur, potentially placing significant burdens on future generations.

Difference #8: Lack of ownership and responsibility in the ocean are even less favourable to sustainable development than on land Implication: Private utilisation of the ocean and its resources is usually dependent on licenses or concessions from public authorities. National authorities have the power to allow private activities in areas under the jurisdiction of the coastal state; the International Seabed Authority can license activities in the area, but in international waters, private activities have much fewer controls. Common property regimes are even scarcer than on land given the mobile nature of many marine resources, which makes the exclusion of non-authorized users extremely difficult.

Difference #9: Humans do not live in the ocean because the sea is not our natural environment; our presence is dependent on the use and development of technology. Our sparse presence in the sea also makes it much more difficult, and costly, to exercise adequate law enforcement.

Sources: Crowder and Norse (2008); Douvère et al. (2007); Douvère (2008); Ehler and Douvère (2007); Norse and Crowder (2005).

challenges from unsustainable practice of utilizing ocean and competition over resources, control of international trade and military activities in its international waters. The implementation of BE to catalyse ocean-driven economic growth is directly linked to threats and challenges confronted by the Indian Ocean, especially to human well-being, food security and maritime safety and security for coastal communities.

The concept of BE thus establishes a mutual platform for governments, private and public partnerships and scientists, establishing a paradigm shift to the methods of utilising ocean-based resources and interactions among various entities.

Challenges before the Blue Economy

Healthy oceans are essential for livelihoods of millions of people, and critical aspects of balanced growth. The sustainable use and development of BE industries is required to be designed and implemented to benefit local communities directly, leading to inclusive growth.

Yet, challenges are faced due to the inability to incorporate innovative methods, resistance to change and economic growth, which is the primary focus of majority of activities.

The challenges within the BE are as follows:

- The coordination and implementing process of projects among different agencies tends to be time-consuming;
- Financial activities under SDG 14- Life below Water – and providing trained human resources to support these activities;
- Lack of understanding based on the importance of BE paradigm and emerging industries;
- Risk of neglecting SDG 14 due to higher priorities depending on the country's interest;
- Balancing trade-off between competing end-uses of ocean spaces; and
- Defining specific criteria for ocean activities, which are currently listed as emerging industries within the BE.
- The establishment and formulation of national ocean policies.

Blue Economy Diplomacy

As mentioned above, the BE contributes highly to improved well-being and social equity, while reducing significantly environmental risks and ecological scarcities. It is important to note that according to the UN Water estimations (2016),⁶ by 2050 it is predicted that the global water withdrawals would increase by 55 percent due to higher demand for production, domestic use and for agricultural supply of emerging economies. The globalization process contributes significantly to SD and to a new term related to the BE as 'hydro-diplomacy', as mentioned by Islam and Repella (2015)⁷. This framework includes three basic assumptions – water is a flexible resource: science, policy and politics combined to create water networks, which are of an increasing complexity. The role and importance of SD, acting as a communication facilitator among interested policy-makers, business entities and scientists within the ocean administration, starts with developments and collaboration on national and sub-national levels dealing with various issues emerging within basin or global scale marine issues/resources; foreign policy decisions - even if they have similar economics and sustainable goals -, and if they are fragmented and lack political power international (Pohl, 2014).⁸ As such, international organisations and governments, whose intentions for the BE are similar, are recommended to establish negotiating processes for institutional and legal conditions along with capacity-building, financial and political coordination on all the four levels.

The BE diplomacy merely focuses on the diplomatic actions behind emerging BE industries, strengthening the role of diplomats in promoting sustainable development. This concept is derived from the green economy concept, reducing environmental risks and ecological scarcities; but the BE is slightly different in terms of the *ocean space* and *blue sectors* (UNEP, 2016).⁹

Representing national interests, diplomats are instruments of promoting politics in developing areas of common interests among different countries. Since trade and investment is a key factor, knowledge on the ways and means

towards nations vision in achieving sustainability are of utmost importance. Many new diplomatic dimensions are developing; the 'blue diplomacy' provides a broad spectrum in the promotion of conservation and sustainable use of ocean resources. The specialisation of diplomats to implement effective and efficient concepts entails cooperation of scientists and CEOs of large corporations. Diplomacy and science is considered to be a holistic approach and essential in the formulation of strategic negotiations, implementation of international treaties or the development of national or international institutions aiming to share knowledge and creating a solid foundation for research and developmental data.

The role of diplomats represents a key aspect to the future success for the implantation of the BE paradigm. Therefore, through the assistance and collaboration between science- and research-based industries, innovative technologies and business community, diplomatic decisions are bound to tackle global challenges with collaboration of nations. Not only does the BE build a bridge between nations and various entities, but it builds a holistic platform to address multiple factors.

Plea for Governance of the Indian Ocean Region and Marine Spatial Planning

It is important to also include and highlight the importance of Ocean Governance within the region. There is a significant high rate and need to preserve marine resources and ecological environment. Maritime shipping lanes and trade flows, fisheries management, science and technological developments, aquaculture and the acidification of the ocean need to be monitored and researched.

This is yet an important aspect to SD, requiring regional governance of ocean states, especially within the IOR. Marine Spatial Planning (MSP) is a strategic tool to plan and manage conflicting ocean uses and their interactions with marine ecosystems. The MSP thus allows and allocates space for marine-based industries and activities to fulfil demand for marine-based industries and activities, fulfilling demand for marine-

based goods and services while facilitating environmental conservation through regulatory and management measures. This concept integrated within the BE is an ideal example for the need of science in diplomacy. The MSP indicates and assists diplomats in making proactive decisions, reducing cross-sector conflicts and safeguarding valuable ecosystem resources. As a continuous long-term aspect within the BE paradigm, there is indeed a shift in diplomatic assessments, negotiations and foreign policies with regards to the use of science, technology and innovation.

Regional Organisations and Missions Towards Science Diplomacy Within the Blue Economy

As BE is a vast subject, covering a wide range of policies and areas of interest, the following case studies highlight the fact that SD is a reality within the IOR and the BE paradigm. Whether it be Science for Diplomacy; Science in Diplomacy or Diplomacy for Science, the reality of pure learning and transfer of innovation, technologies and science cooperation is a necessity and much is integrated across the globe.

Science for the Blue Economy and Africa's potential - (Science for Diplomacy)

The BE buzzword has brought a newly developed, a new paradigm to diplomatic corps. Being a holistic approach to different sectors, the BE is receiving increasing attention as a key to development of the African region. At the 19th Session of the Intergovernmental Committee of Experts (ICE), held from the 2 to 5 of March 2015 in Madagascar, delegates recognised that the BE in Eastern Africa has an important role to play in contributing to structural transformation, sustainable economic growth and enduring social development.

The BE is an ever-growing economic opportunity for governments and private sectors which act as the main initiator to economic

development. The sustainable use of aquatic ecosystems, inclusiveness, conservation on the principles of the Sustainable Development Goals 6 and 14 on “Ensure availability and sustainable management of water and sanitation for all” and “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”, respectively, are main areas influencing the use of SD.

African Case Overview

The International Seabed Authority (ISA), whose main function is “to regulate deep seabed mining and to give special emphasis ensuring that the marine environment is protected from any harmful effects which may arise from mining activities including exploration and exploitation”, has issued exclusive exploration permits to the China Ocean Mineral Resources Research and Development Association (COMRA) and the Republic of Korea, to undertake polymetallic sulphides’ exploration in the Indian Ocean. The Authority has also given a permit to the Government of India to undertake polymetallic nodules exploration in the Indian Ocean. This is an opportunity that Eastern African countries should also exploit. The resources of the high seas are international public goods to which all nations have a legitimate right. Thus, as discussed in Madagascar, Eastern African Member-States should approach ISA either together or individually to assert their rights and establish their claims to deep-ocean resources.

The findings of the report demonstrate that despite significant endowments in BE resources, Eastern Africa has failed to achieve growth with sustainable and inclusive development, and poverty still is prevalent in the region. Traditional and non-traditional BE sectors face challenges that believe their potential contributes to inclusive growth. This can only be achieved if there is a better alignment between different BE sectors and greater coherence between schemes and initiatives. This requires significant investment of time and energy on the part of decision-makers, who need to build stakeholder consensus and promote corporate social responsibility by engaging private-sector associations. The

BE development can only take place with the participation of stakeholders at all levels and at all stages. Social inclusion in the distribution of benefits is essential as is the focus on small- and medium sized producers and the use of cutting-edge technology, while promoting food security in the region.¹⁰

India’s approach to Science Diplomacy – Case Study – Science for Diplomacy

India’s effort to harness Blue Economy received boost with the establishment of the International Training Centre for Operational Oceanography (ITCOocean). This Centre operates under the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad, known for its expertise in ocean sciences and services, including advisory to society, industry, government agencies and the scientific community through sustained ocean observations.

The ITCOocean serves as a specialist institution for Operational Oceanography and a field of study relating to systematic and long-term measurements of various changes in the oceans and atmosphere, and undertakes interpretation and dissemination of data in the form of ‘now-casts’, ‘forecasts’ and ‘hind-casts’ to a number of stakeholders. This centre is also expected to commence work in June 2018, and will train technical and management personnel engaged in varied sectors of the Blue Economy such as fisheries, seabed and marine resource development, shipping and ports, coastal tourism, marine environment, coastal management, etc.

The ITCOocean potentially can support development of Blue Economy in the Bay of Bengal through capacity-building in at least five ways. First, it can serve as a regional hub for collation and dissemination of scientific data among regional science centres and communities. For instance, in Bangladesh, the National Oceanographic and Maritime Institute (NOAMI), Bangladesh Oceanographic Research Institute (BORI) and National Oceanographic Research Institute (NORI) can be part of the ITCOocean network for Bay of Bengal Blue Economy initiatives.

Second, Blue Economy is data-intensive, which is a function of the collection of observations generated through satellites, research vessels, sea-based sensors, including those embedded in the ocean floor, and weather modelling. These systems, devices and processes generate tens of terabytes of data and require technology and expertise to interpret it for the operational use. Further, oceanographers and scientists operate with diverse data types obtained through a variety of national technical means and methodologies. At the ITCOcean, an oceanographic data-bank for use by the regional scientific community can support regional initiatives to study and harness the oceans in a sustainable manner.

Third is human resources training in oceanography and creating a gene pool of professions to support national Blue Economy programmes in the regional countries. India has an excellent track record of training scientists, and in the last few years, besides training scientists for their own needs, the INCOIS faculty has trained 105 scientists from 34 other countries in different aspects of operational oceanography.

Fourth is supporting innovation for ocean-related disruptive technologies, which are transforming modern day operational oceanography. Big data, artificial intelligence, augmented reality/virtual reality, block-chain technology and additive manufacturing commonly known as '3D printing' are mushrooming and driving innovation to augment operational oceanography. For instance, 3D printing technologies support real-life applications in oceanography through hydrodynamics, biomechanics, locomotion and tracking and surface studies. Another significant use of 3D printing is in the preparation of coral reef replicas, and thereafter seeding corals to restore damaged reefs.

Fifth, ITCOcean is also an important diplomatic tool for science diplomacy. The Indian government has promoted Blue Economy in multilateral fora at regional and sub-regional levels, such as the Indian Ocean Rim Association (IORA) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation

(BIMSTEC). As far as the latter is concerned, the 15th BIMSTEC Ministerial Meeting's joint statement notes that member countries agreed to constitute a Working Group to develop Blue Economy. In that spirit, Bangladesh hosted an international conference in October 2017, where it was noted that the lack of scientific marine knowledge and technology could be the Achilles Heel of Blue Economy development in the Bay of Bengal.

Although ITCOcean is well-positioned to support high-end Operational Oceanography, there would also be a critical need to establish vocational institutions to promote and train and skill workers adept at understanding the oceans and working in industries that support Blue Economy.

Indian Ocean Rim Association Leaders' Summit in March 2017 in commemoration of the 20th Anniversary – Jakarta Declaration on Blue Economy – Science for Diplomacy

Declaration

Declaration of the Indian Ocean Rim Association on the Blue Economy in the Indian Ocean Region

Jakarta, Indonesia - 8 - 10 May 2017

We, the Ministers and representatives of the Member States of the Indian Ocean Rim Association (hereinafter referred to as "IORA"), the Commonwealth of Australia, the People's Republic of Bangladesh, the Union of Comoros, the Republic of India, the Republic of Indonesia, the Islamic Republic of Iran, the Republic of Kenya, the Republic of Madagascar, Malaysia, the Republic of Mauritius, the Republic of Mozambique, the Sultanate of Oman, the Republic of Seychelles, the Republic of Singapore, the Federal Republic of Somalia, the Republic of South Africa, the Democratic Socialist Republic of Sri Lanka, the United Republic of Tanzania, the Kingdom of Thailand, the United Arab Emirates and the Republic of Yemen attended the Second IORA Ministerial Blue Economy Conference (BEC-II) in Jakarta, Indonesia, on 8 - 10 May 2017;

Recalling

- the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and other international conventions and instruments related to the activities in the oceans and seas;
- Goal 14 of the Sustainable Development Goals (SDGs), to conserve and sustainably use the oceans, seas and marine resources;
- the Recommendations and the Declaration of the First Ministerial Blue Economy Conference in Mauritius on 2-3 September 2015;
- the Jakarta Concord on Promoting Regional Cooperation for A Peaceful, Stable and Prosperous Indian Ocean, signed in Jakarta, Indonesia, on 7 March 2017;
- Relevant UNGA Resolutions, including 61/105, 64/72, 66/68, 69/292;

RECALLING ALSO the intention to implement the IORA Action Plan of 2017-2021, as adopted by the Council of Ministers' (COM) Meeting in Jakarta, Indonesia, on 6 March 2017;

RECOGNISING that oceans, along with coastal and marine resources, play an essential role in human well-being and social and economic development;

STRESSING the need for the IORA Member-States to harness the potential of the Blue Economy to promote economic growth, job creation, trade and investment, and contribute to food security and poverty alleviation, whilst safeguarding ocean's health through sustainable development of its resources;

CONCERNED about the disparities in economic development of the IORA Member-States, including in skills and human resource development, research and development, business opportunities, resource allocation; technology and innovation and its impact on the public and private sector, including the Small and Medium Enterprises (SMEs);

AWARE OF the need to promote communication and maritime connectivity in the Indian Ocean region;

STRESSING the need to promote observation, protection, conservation and sustainable use

of ocean resources so as to continue to meet the needs of the present without comprising opportunities of future generations;

REAFFIRMING that research and investment are required to address key challenges of the IORA and to provide solutions and create a friendly business environment to attract investors in the Blue Economy in the Indian Ocean region;

RECOGNISING the importance of promoting entrepreneurship, innovation and SMEs, with a special focus on promoting youth and women's engagement in the sustainable development of the Blue Economy;

MINDFUL OF increasing challenges, both natural and human factors, such as overexploitation of resources, increasing marine plastics debris and nutrient pollution, illegal, unreported and unregulated (IUU) fishing, over fishing, destructive fishing, crimes in the fisheries sector, biodiversity loss and its impacts on blue carbon stocks, illegal mining and the impacts of global climate change and natural disasters;

ENCOURAGING the IORA Member- States to move towards integrated and ecosystem-based approaches in the management of marine resources to maximise sustainable economic yield from the ocean, including through utilising appropriate management tools such as marine spatial planning, marine protected areas, etc.;

RECOGNISING the importance of public-private partnerships in the development of and cooperation in the Blue Economy;

ENCOURAGING sharing of information, experiences, expertise, best practices and technology in Blue Economy related cooperation among IORA Member- States and Dialogue Partners;

ACKNOWLEDGING the outcomes of IORA Blue Economy events on related topics, including marine aquaculture, marine tourism, postharvest processing, seafood safety and quality, maritime connectivity, port management and operation, ocean observation monitoring, forecasting and seabed minerals and hydrocarbons;

HIGHLIGHTING importance of collaborating

and cooperating with relevant stakeholders, including regional and international organisations for the advancement of the Blue Economy in the Indian Ocean region;

ENCOURAGING IORA Member -States to mainstream ocean-related issues in their national planning and policy-making process, based on their priorities;

EMPHASISING the need to foster support and financing opportunities, as well as promote transfer of technology, capacity -building and skills development for local fishery entrepreneurs and coastal communities directly dependent on the sea, including through triangular cooperation;

REAFFIRMING IORA's role and commitment in the development of the Blue Economy through the sustainable use, management, observation, protection and conservation of marine resources in the Indian Ocean region;

REITERATING on the commitment to establish an IORA Working Group on the Blue Economy, which would enhance cooperation to promote Blue Economy.

We, the Blue Economy Ministers/Head of Delegations of the Member -States of the Indian Ocean Rim Association;

Hereby Declare as follows:

That the Member-States of the IORA will be guided by the following principles when developing and applying blue economy approaches to sustainable development and enhancement of socio-economic benefits, particularly of the coastal communities, in the Indian Ocean Region.

- The Blue Economy should ensure sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts, by including strengthening their resilience and taking action for their restoration in order to maintain healthy and productive oceans, and achieve inclusive economic growth in the Indian Ocean region;
- The development of IORA's Blue Economy priority sectors, namely: Fisheries and Aquaculture; Renewable Ocean Energy; Seaports and Shipping; Offshore Hydrocarbons

and Seabed Minerals; Deep Sea Mining, Marine Tourism; and Marine Biotechnology, Ocean Observation, Research and Development, should be carried out in an environmentally sustainable manner;

- IORA Member- States are encouraged to pledge their voluntary commitments, including implementation of capacity-building programmes, in the concerted effort to strengthen cooperation in the blue economy;
- IORA Member- States are encouraged to develop their Blue Economy sectors based on their priorities, which could contribute to boosting their economic growth and contribute to job- creation and poverty alleviation;
- IORA Member -States, in collaboration with Dialogue Partners, should encourage the financing of ocean economy infrastructure and development projects, including development and investment in the Economic Development Zones as well as investment and exploration of new technologies for Blue Economy Development;
- IORA Member- States and Dialogue Partners should enhance cooperation and collaboration to promote: research and development; networking; technology transfer; sharing of information, data and best practices; exchange programmes and expertise; and networking across the Indian Ocean region for sustainable development of the Blue Economy;
- IORA Member -States should adopt ecosystem-based approaches to sustainably manage and use their marine resources, while protecting and conserving marine environment;
- IORA Member- States are encouraged to consider full range of technologically advanced solutions as well as local wisdom and traditional knowledge, as appropriate in the context of adaptation and mitigation strategy to confront climate- change effects on societies;
- IORA Member -States, in collaboration with Dialogue Partners, should promote capacity-building, including collaboration of ocean observation training and scientific capacities, and skills development in the Blue Economy sector through collaboration reinforcing

and networking with relevant regional/ international organisations and institutions in the Indian Ocean region;

- IORA Member- States, in collaboration with Dialogue Partners, need to address challenges and key issues related to the Blue Economy, including overexploitation of resources, marine plastics debris pollution and nutrient pollution, biodiversity loss, IUU fishing, illegal mining, and climate change and its impact on marine resources, and ecosystems;
- Collaboration between IORA Member- States and Dialogue Partners in various aspects, including financing and development of Blue Economy activities and projects; technology transfer should be strengthened to ensure balanced economic development in the Indian Ocean region;
- Cooperation among IORA Member -States, Dialogue Partners and relevant stakeholders in: carrying out marine scientific research; sharing, collecting, and managing data and information; and implementation of concrete projects on emerging ocean science and blue economy issues;
- The development of effective legal, regulatory and institutional frameworks and ocean management policies should be enhanced as appropriate, for informed decision and policy-making, which are crucial steps toward structuring and guiding its growth;
- Sustainable development of the Blue Economy should be in accordance with the 1982 United Nations Convention on the Law of the Sea (UNCLOS);
- IORA Member- States are encouraged to promote public-private partnerships and involvement of business communities in developing Blue Economy, including infrastructure development and transfer of technology in varied blue economy sectors such as: fisheries and aquaculture; ocean observation; renewable ocean energy; seaport and shipping; deep sea mining and marine tourism, including cruise tourism;
- IORA Member -States should cooperate to promote efficient monitoring and inspection programme to prevent maritime trade of uncertified/unauthorized chemicals and pesticides;
- IORA Member -States consider, if deemed necessary, supporting the establishment of an IORA business travel card to ease business travel on blue economy businesses and collaborate with member -countries ready to do so;
- IORA Member-States, in accordance with international laws and consistent with existing obligations, should perform environmental impact assessments before engaging in relevant deep- sea mining activities and fulfil relevant obligations to ensure effective protection of marine environment from any harmful effects of deep- sea mining;
- IORA Member -States are encouraged to adopt and implement transparency and traceability measures to strengthen application of sustainable fishing practices by regulating harvesting and ending poverty, fight against IUU Fishing destructive fishing and crimes in fisheries sector; providing access to small -scale artisanal fisheries to marine resources and markets and protect food security;
- The empowerment of women and youth to participate in the development of the blue economy is essential through better access to education, training, technology and finance. Women and youth should be encouraged especially by supporting MSMEs and small-scale fisheries, to be equitably included in the sustainable economic growth;
- The proposed Working Group on the Blue Economy would consider programmes, activities, pilot projects and studies for regional cooperation in the Blue Economy;
- IORA Member -States consider developing a Master Plan on the Blue Economy to identify and prioritize concrete projects and tangible areas of cooperation, to promote blue economy as a driver for socio-economic development;
- The sustainable development of the IORA priority sectors of the Blue Economy in the Indian Ocean Region would contribute to: food security; poverty alleviation; the mitigation of and resilience to the impacts of climate change; enhanced trade and investment;

enhanced maritime connectivity; economic diversification; job -creation and socio-economic growth;

- IORA Member -States and Dialogue Partners should increase economic benefits derived from the Blue Economy to Small Island Developing States (SIDS) and least developed countries (LDCs) from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism;
- Collaboration among IORA Member -States, Dialogue Partners, research institutions, industries and public-private partnerships should be enhanced to create an environmentally sound business environment and attract foreign investment, which would accelerate commercialization of ongoing research in exploring data and in creating new products derived from marine and maritime data resources;
- IORA Member- States, in collaboration with Dialogue Partners, are encouraged to carry out pilot projects and set-up modern and accessible technologies to effectively develop Blue Economy in a sustainable manner.

ADOPTED by the Blue Economy Ministers/ Head of Delegations of the Member- States of the Indian Ocean Rim Association on 10 May 2017 at Jakarta, Indonesia.

The above Declaration between the 21 Member-States of IORA, is a pure case of SD within the IOR for prosperity, peace and perseverance of not only marine resources, but a relationship among IORA countries.

The Indian Ocean Rim Association Blue Economy Core Group

Case Study - The Blue Economy Core Group (BECG) - Science in Diplomacy

BECG was established with the IORA Secretariat funding in 2014. The first workshop was held in Durban, South Africa from 4 - 5 May 2015, focusing on the Promotion of Fisheries & Aquaculture and Maritime Safety & Security Cooperation in the Indian Ocean region. The second workshop on Maritime Connectivity and

Financing for Development in the Indian Ocean Rim, took place at Qingdao, China from July 13-14, 2016. Both of these workshops were well attended and have assisting in bringing to the fore important regional issues and initiatives related to these aspects of the Blue Economy in the Indian Ocean region.

The Third workshop of the BECG held on 10-11 April 2017, focussed on measures and actions which are to be taken in order to deal with issues of environmental sustainability, climate change adaption and disaster risk reduction. Several topics were addressed, including *inter alia*: impacts of climate change on coastal environment and marine resources; approaches toward disaster risk prevention, reduction and management; collaboration to strengthen early warning systems and search and rescue through holistic approach by mainstreaming disaster risk management in educational programmes; community resilience and integration for disaster risk reduction, preparedness and response; post-disaster management, construction and rehabilitation; and public-private partnership for sustainable post-disaster construction.

Objectives

To enhance coordination and sharing of knowledge, information and best practices on Blue Economy, including disaster risk prevention, reduction and management, as well as Risk Transfer Mechanisms and community resilience in the IOR region;

- To enhance resilience of the communities to climate change-driven disasters and hazards;
- To increase public awareness on environmental sustainability and blue economy in the IOR region;
- To strengthen networking among institutions, experts and regional organisations in IOR region;
- To promote public-private partnership for the sustainable development of the Blue Economy;
- To identify potential projects of collaboration in developing the Blue Economy in the IOR..

The Second Indian Ocean Expedition - Science in Diplomacy

The Second International Indian Ocean Expedition (IIOE-2) is a major global scientific programme which will engage international scientific community in collaborative oceanographic and atmospheric research from coastal environments to deep-sea over the period 2015-2020, revealing new information on the Indian Ocean (i.e. its currents, its influence upon the climate, its marine ecosystems), which is fundamental for future sustainable development and expansion of the Indian Ocean's blue economy. A large number of scientists from research institutions from around the Indian Ocean and beyond are planning their involvement in IIOE-2 in accordance with the overarching six scientific themes of the programme. Already some large collaborative research projects are under development, and it is anticipated that by the time these projects are underway, many more would be in planning or about to commence as the scope and global engagement in IIOE-2 grows.

Focused research on the Indian Ocean has a number of benefits for all nations. The Indian Ocean is complex and drives the region's climate including extreme events (e.g. cyclones, droughts, severe rains, waves and storm surges). It is the source of important socio-economic resources (e.g. fisheries, oil and gas exploration/extraction, eco-tourism, and food and energy security) and is the background and focus of many of the region's human populations around its margins. Research and observations supported through IIOE-2 would result in an improved understanding of the ocean's physical and biological oceanography, and related air-ocean climate interactions (both in the short-term and long-term). The IIOE-2 programme will complement and harmonize with other regional programmes underway and collectively outcomes of IIOE-2 would be of huge benefit to individual development and regional sustainable development as the information is a critical component of improved decision-making in areas such as maritime services and safety, environmental management, climate monitoring and prediction, food and energy security.

IIOE-2 activities would also have a significant focus on building the capacity of all nations

around the Indian Ocean to understand and apply observational data or research outputs for their own socio-economic requirements and decisions. IIOE-2 capacity-building programmes will, therefore, be focused on the translation of the science and information outputs for societal benefit and training of relevant individuals from surrounding nations in these areas.¹¹

MH370 Clear Case of SD - Science finding answers to Diplomatic and Nations Questions - Diplomacy for Science Case

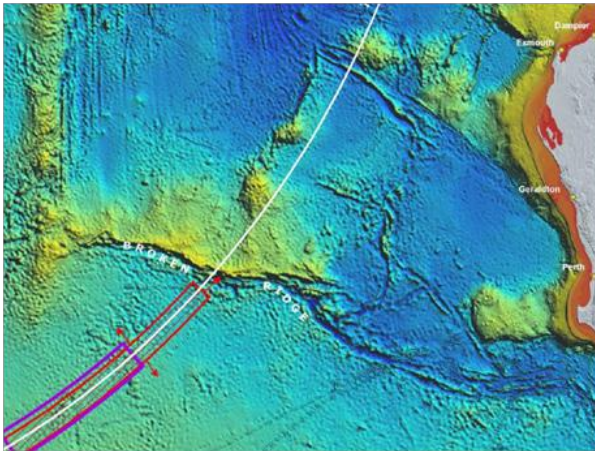
The flight that disappeared on 8 March 2014 while flying from Kuala Lumpur International Airport, Malaysia, to its destination, Beijing Capital International Airport in China. The aircraft, a Boeing 777-200ER operated by Malaysia Airlines, last made voice contact with air traffic control at 01:19 MYT, 8 March (17:19 UTC, 7 March) when it was over the South China Sea, less than an hour after take-off. The aircraft disappeared from air traffic controllers' radar screens at 01:22 MYT, but was still tracked on military radar as it deviated westwards from its planned flight path and crossed the Malay Peninsula.

The search continues and the question remains unanswered. Where does the diplomacy for science in this case appear? There is an extensive and expensive research programme still underway which needs to be leveraged by different countries within the Indian Ocean Region. Find answers to nations' questions, providing answers based on scientific research programmes to governments.

Dr David Griffin, an Australian oceanographer at the CSIRO, has discovered that the missing plane could only be 35 degrees south in the southern Indian Ocean. "The oceanographic reason for why 35 [degrees south] is more likely than say 34, or 33, or 32, is that at all those latitudes the current goes to the east," he said.

"So if the crash had been in any of those latitudes then there would be a high chance of at least one or two things turning up in Australia, whereas there have been 20 or 30 or so items turned up in Africa, and not a single one to Australia. "Once you start looking in the vicinity of 36 to 32, then 35 is the only option." His claims

Figure 3: The MH370 search area has been assessed and reassessed



that the plane could be near to this location as Australian investigators believe there were five different autopilot control modes MH370 could have been on when it plunged into the ocean.

Calculations from four of those settings led to a location 36-39 degrees south or further north at 33-34 degrees south. But according to the ABC, a source close to the investigation, said only one of the five autopilot settings – constant magnetic heading (CMH) – would lead to a crash site at 35 degrees south, where the ocean current was moving towards Africa. This would explain why most of the debris believed to be from the MH370 flight recovered off the African coast in places like Mauritius, Reunion Island, Tanzania and Mozambique.

The claim comes after the Australian Transport Safety Bureau released a report that narrowed the search zone for the missing plane down to an area half the size of Melbourne in August 2017. The report placed the most likely location of the aircraft “with unprecedented precision and certainty” at 35.6°S, 92.8°E – in between Western Australia and Madagascar.

Malaysia’s government has vowed to pay a US company ‘Ocean Infinity’ up to \$70 million if it can find the wreckage or black boxes of Malaysia Airlines Flight 370 within three months in a renewed bid to solve plane’s disappearance nearly four years ago. Transport Minister Liow

Tiong Lai said there was an 85 per cent chance of finding the debris in a new 25,000 square km area – roughly the size of Vermont – identified by experts.

The government signed a “no cure, no fee” deal with the Houston, Texas-based company to resume the hunt for the plane, a year after the official search by Malaysia, Australia and China in the southern Indian Ocean was called off.

“The primary mission by Ocean Infinity is to identify the location of the wreckage and/or both of the flight recorders ... and present a considerable and credible evidence to confirm the exact location of the two main items.”

If the mission is successful within three months, payment would be made based on the size of the area searched.

Liow said the government pay Ocean Infinity \$20 million for 5,000 square km of a successful search, \$30 million for 15,000 square km, \$50 million for 25,000 square km and \$70 million if the plane or recorders are found beyond the identified area.

Ocean Infinity Chief Executive Oliver Plunkett said the search vessel Seabed Constructor, which left the South African port of Durban, is expected to reach the southern Indian Ocean by Jan. 17 to begin the hunt. He said eight autonomous

Figure 4: Autonomous Underwater Vehicles (AUVs) which will be put in the ocean to search for the wreckage of the missing plane, MH370.



Figure 5: A large piece of debris found in Tanzania recently which has been confirmed as a part of a wing flap from missing Malaysia Airlines passenger jet MH370.



Figure 6: The 'Seabed Constructor' which has been dispatched to the southern Indian Ocean to search for the wreckage of the missing plane, MH370.



underwater vehicles, which are drones fitted with hi-tech cameras, sonars and sensors, would be dispatched to map seabed at a faster pace. Plunkett said the underwater drones can cover 1,200 square km a day and complete the 25,000 square km within a month.

"We have a realistic prospect of finding it," he said. "While there can be no guarantee of locating

the aircraft, we believe our system of multiple autonomous vehicles working simultaneously is well suited to the task at hand."

The official search was extremely difficult because no transmissions were received from the aircraft after its first 38 minutes of flight. Systems designed to automatically transmit the flight's position failed to work after this point, said a final report from Australian Transport Safety Board last January.

"I feel very happy but at the same time very panicky whether it can be found or not. Now it's back to four years ago where we have to wait everyday (to find out) whether debris can be found," said Shin Kok Chau, whose wife Tan Ser Kuin was a flight attendant on MH370.

Underwater wreck hunter David Mearns said the new search takes into account oceanographic models used to drastically narrow the possible locations of the crash and deploys state-of-the-art underwater vehicles that will allow the company to cover far more seabed at a faster pace.

"There are no guarantees in a search of this type. However, notwithstanding that uncertainty, this upcoming search is the best chance yet that the aircraft wreckage will be found," he said.¹²

Recommendations

The following recommendations are proposed to enhance Science Diplomacy:

- **Ocean Governance:** well defined legal regimes for ocean exploration and marine spatial planning; enforcement of regulations and maritime safety and security are prerequisites for harnessing the BE;
- **Innovators:** financing the BE, supporting the development of ocean-related technologies to further regional research, capacity- building and job- creation;
- **Technology:** encouragement by governments on the aspect of continued research and development from ocean observations, use of innovative technologies, integration of data, collecting environmental and underwater data transcribed into accessible platforms for policy-makers to use as the key to effective

decisions and harnessing full potential of the BE paradigm;

- **Integrated Management Techniques:** efficient resource management is the key to the BE. Furthering and promoting MSP and Integrated Coastal Zone Management (ICZM) and efficient marine administration;
- **Use of soft powers to Science and Technology** as a tool for building long-term relationship based on human resource development and capacity- building;
- **Mitigating science and technological gaps;**
- **Enabling people-to-people contact** as a tool for public diplomacy through Science and Technology engagements;
- The **visibility** of the importance of the overall contribution towards the economic development within the Indian Ocean region. Creating a common platform to increase the visibility of the industry, able to attract required workforce, ensuring sustainability and effective developments within the BE development paradigm;
- Member States are encouraged to develop '*Blue Educational*' technical and vocational education and training (TVET) institutions/ programmes. These Technical and Vocational colleges and manual labour should be made compulsory in the Indian Ocean region;
- The preparation and implementation of an '*integrated blue skills development strategy*' is essential if workers are to acquire job-specific skills and knowledge;
- Member States are encouraged to promote and provide entrepreneurship programmes to citizens in coastal regions. This would contribute to sustainable coastal management techniques and contribute to Sustainable Development Goals.
- **Increase funding for knowledge-creating** basic science and provide increased financial support to S&T-related activities in universities, research institutes and think-tanks;
- **Re-establish a Ministry of State for Science and Technology** as an interface with other levels of government and to coordinate and integrate S&T programmes and activities

across federal governments and among civil society actors;

- **Offer courses in science diplomacy/ international S&T** on a regional basis within the Indian Ocean Region and encourage practice of public and science diplomacy;
- **Through recruitment, secondments, exchanges, promotions and incentives,** encourage Foreign Service Officers to skill-up and specialize in international S&T issues management.

Conclusion

Blue Diplomacy as a global concept is mainly a subject of interest among many Indian Ocean states which have opening shores to the water. Since this is a new developing concept regarding the sustainable use of ocean resources, diplomatic tactics and negotiations among countries include a wide range of scientific facts and figures. Trade agreements and establishment of international legislations regarding private sector developments are clear evidence that the Member States within the IOR are investing and developing national policies to enhance regional cooperation with regards to the BE.

It is impossible to carry out and achieve all the SDGs set by 2030. Countries follow different pathways with reference to SDGs, and, therefore, SD plays a critical role to assist Developed and Least Developed Countries (LDCs) which are unable to attain certain SDG Goals. The establishment of the bridge between diplomats and scientists allows countries to promote effective bi-lateral collaborations and to transfer technologies. Instead of being disconnected in terms of different SDG Goals, SD provides an ideal platform as highlighted in the case studies above to find mutual interests, develop R&D, sharing of technologies and finding mutual agreements to achieve sustainability.

The BE as a holistic approach to the management of ocean resource and connecting nations has a great overall impact on diplomacy tactics and policy developments. Diplomacy has become something very much more than the diplomacy of states and governance; it has evolved into a science-based arena, equipping

diplomats with enhanced skills and abilities to draw up accurate and competent foreign policies. Not only does the role of diplomats represent the future, success of implementing the concepts discussed throughout the paper, it acts as an initiator to research and developmental innovations towards a better future. Diplomatic background now requires academic and science on various subjects related to innovation, sustainable developments and technology. This determines economic involvement and assists the framework to respond to basic needs for effective foreign policy measures. Innovation and technological developments are crucial in SD, and for a sustainable development measures. The enhanced quality of life in terms of 'health-care', regional cooperation on areas of mutual interest, job creation and social capital development, especially within the BE paradigm are critical.

Above all, SD and the BE go beyond the traditional thinking, where oceans are looked upon only as a resource providing and promoting oceans as life-support system. SD and the BE coincides in preserving oceans health, recognising the approach to achieve SDGs set by the United Nations. This paradigm shift provides SD as an ideal arena for collaborative research, innovations and technological developments, establishing a wide range of available data for effective and efficient policy developments.

The '*Blue Revolution*' binds nations and SD for the betterment of the globe as a whole, yet the questions seem simple in SD, but the answers are explosive. Global concerns have provided 17 SDGs, providing the common global language for science, political influences, innovations, R&D and capacity-building.

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Role of Science Diplomacy – The Indo-Mauritian Collaboration



Balgobin Dayachand*

Introduction

Mauritius, being a small island developing state, cannot sustain its development on its own as many countries in the world can. Collaboration can purely be of social and economic nature or can as well be of scientific and technical nature. The focus of this paper is to give an insight of the scientific nature of the cooperation and collaboration between Mauritius and India.

Collaboration of the scientific nature among countries has been existing since a long time but the term Science Diplomacy, recently coined, is categorized into the following three broad aspects according to the American Association for the Advancement of Science (AAAS)- diplomacy for science, science in diplomacy, and science for diplomacy.

Although at present, Mauritius has oversea missions in around 20 countries, it is worthy to note that the connection between Mauritius and India dates back to 1730. It established Diplomatic relations in 1948, well before Mauritius was declared Independent in 1968. After being occupied by the Dutch (1638-1710), French (1715-1810) and by the British (1810-1968), the country achieved freedom on 12 March 1968. Around half a million Indian indentured labourers were brought into Mauritius between 1834 and early decades of the 20th century, and out of them about two-thirds settled permanently in Mauritius. At present, 68 percent of the Mauritian population is of Indian origin.

India and Mauritius have been celebrating close collaboration since many years. India having a strong science and technology has been helping Mauritius in areas as diverse as Information and Communication Technology, Biotechnology, Environment,

* Manager/Curator, Rajiv Gandhi Science Centre, Republic of Mauritius

Hydrography, Legal Meteorology, Telemetry and Education.

As far as Tertiary Education is concerned, India is one of the most preferred host-country every year for Mauritian students for higher studies (undergraduate and postgraduate); around 90 scholarships are offered every year to Mauritian students to pursue studies in Indian Institutions.

With the above background, it is very clear to understand that post-independence, the priority of the country was to build a robust education system. To make education accessible to less fortunate ones, education was made free in 1976 and more recently in 2005; even transport facility has been made freely available to school students. Lots of efforts have been made over years to move the country towards a fully literate and technologically empowered nation.

Over the years, the literacy rate growth in Mauritius has been quite impressive; in 2011, the adult literacy rate was around 90 percent. However, considering science literacy, scenario is not quite encouraging (See Table below).

Science is a universal subject, and is a must for growth of the country. The nation needs critical mass of engineers, medical doctors, architects and other professionals as well as technical resource to meet future socio-economic challenges of the country. Even for those not opting for science as a career, its basic knowledge is crucial for better understanding of body for its proper healthy nutrition and for mitigation of abrupt climatic changes.

So there was an urgent need to address the

issue of low science enrolment rate, and among the various measures, the proposal for setting-up a science centre was initiated, leading to the setting-up of the Rajiv Gandhi Science Centre in Mauritius.

Rajiv Gandhi Science Centre

This was set up on 3 October 1998 based on the Memorandum of Understanding between the then Ministry of Education and Human Resource Development, Mauritius and the National Council of Science Museums of India. Accordingly, the Government of India provided expertise in designing of exhibition galleries, supplied all exhibits and teaching aids and the Mauritius Government's main role was to provide land, construct building and run the Centre thereafter.

Considering India's vast expertise, the National Council of Science Museums (NSCM), Kolkata, was mandated to design and fabricate exhibits for exhibition galleries, outdoor science park, and a Mobile Science Exhibition. The NCSM was closely involved in planning of the Science Centre while interacting on technical matters relating to building construction

The RGSC was inaugurated on 30 November 2004 by Mrs Sonia Gandhi, and since then, the Centre has received more than 400,000 visitors. Presently, operational under the aegis of the Ministry of Education, Human Resources, Tertiary Education, Science, Research and Technology, the RGSC has one of its objectives, to inculcate scientific awareness in current and relevant fields and arouse curiosity among the public, in general.

Percentage of Students Opting Science Subjects

	Physics	Chemistry	Biology	Computer Science	Total Number of Students Examined
2012	30	32	25	33	15,918
2013	27	27	21	32	17,336
2014	25	25	19	34	17,102
2015	23	22	16	31	18,231
2016	24	22	13	34	17,506

Source : Mauritius Examination Syndicate

After 13 years of successful operation, the RGSC has realized its vision of becoming a Centre of Excellence in the communication and promotion of Science and Technology (S&T).

Wide Range of Activities and Achievements

The Rajiv Gandhi Science Centre set up on 5.3 acres, has a building on 4000 m², and has following objectives.

- Promote science and technology through various programmes, activities and exhibitions
- Supplement school education in a non-formal way through science demonstration lectures, science fairs and seminars for school students
- Inculcate scientific awareness in current and relevant fields and curiosity among public in general.

Visit to the Science Centre is not the only service the Rajiv Gandhi Science Centre has to offer. With a view to reach out a large number of students, the Centre is much more activity driven and conducts number of programmes.

Over the years to ensure repeat visitors to the Centre, the RGSC is involved in developing new



Activities	Audience Reached out
Develop and acquire new exhibits on emerging areas of technology – Chemical Weapon Corner and Rise of Digital India	11,200
Encourage students to undertake science projects that would enhance their Creativity, Reasoning ability and Skills – Model Glider Competition, Young Scientist in Action, Science Quest Competition, Kiddy Science Fair etc.	5,875
Organize lectures, seminars and workshops for various target groups – Workshops, Seminars, etc.	2,177
Develop interactive educational programmes in Science and Technology- Science Fairs, Biology Exploration Camp and Junior Mobile Science	2,706
Create awareness in impact of Science and Technology in Society – Sky Observation Programmes, Transit of Mercury, Solar Eclipse, National Science Week, etc.	11,555
Acquire and disseminate latest information in science and technology – Rajiv Gandhi Memorial Lecture, Science Popularizing Public Lecture	480
Collaborate with other Institutions for the promoting of Science and Technology – Africa Code Week, Science demonstrations, Setting- up of STEM Network, etc.	12,060
	Total : 46,053

Source: Rajiv Gandhi Science Centre



exhibitions in the fields of interest. Last year, there was an exhibition related to impacts and use of Chemical Weapon. A travelling exhibition was also hosted at the RGSC entitled “Rise of Digital India”. The exhibition showcased phenomenal rise of Computer Sector and Digital Technologies in India after Independence.

As a means to support school curriculum in a non-formal way, the RGSC also organizes programmes to encourage creativity, reasoning ability skills like Science Quest, Model Glider

Competition Programme around celestial events, like transit of venus that was visible from Mauritius and Solar eclipses, attract visitors. On regular basis, the RGSC organizes sky observation programmes in different locations of the country. The solar eclipse in September 2016 attracted around 5,000 visitors to the Centre, and around 17,000 special solar eclipse glasses were sold to school -students and public.

The RGSC also creates awareness to specific groups of audience on specific areas through public lectures. The Rajiv Gandhi Memorial Lecture

,being a traditional annual event, was delivered last year by Dr Ramesh Caussy, Chief Executive Officer and Founder, Partnering Robotics on a topic entitled “ Economie numérique et cognitive : Innover ou être Disrupté ” to an audience of 120 science professionals, administrators and general public.

Forthcoming collaboration – Setting up of a Satellite Centre

The setting up of the Rajiv Gandhi Science Centre was the end of the collaboration between the RGSC and the NCSM through their respective governments.

At the 10th Session of the Indo-Mauritian Joint Commission, held in December 2007 in Mauritius, the proposal to set up a Planetarium for the Rajiv Gandhi Science Centre, was retained and approved by the then Minister of Finance and Economic Development, Mauritius, Hon. R. Sithanen, and the then Minister for External Affairs of India, Shri P.Mukherjee.

During the state visit of the Honourable Navinchandra Ramgoolam, GCSK, FRCP, Prime Minister of Mauritius, to India in February 2012, a second Memorandum of Understanding was signed between the Government of the Republic of India through the National Council of Science Museums and the Government of the Republic of Mauritius through the Rajiv Gandhi Science Centre Trust Fund for the Planetarium.

The agreement says that two countries would help in setting up a satellite centre, including construction of a 12 diameter Digital Planetarium with latest technological projection systems, two new exhibition galleries, and revamping of old galleries at the Centre.

Based on the similar agreement for the phase 1, the responsibility of the Government of Mauritius is for building construction. The Government of India would be providing all equipment for the digital planetarium, exhibits for new and existing galleries, which would be costing INR 104.6 Million. The Planetarium would indeed be unique in the Indian Ocean and would attract Mauritians as well as other tourists.



The land where the Planetarium would be constructed has already been earmarked; it would be near the university campus at Réduit. The satellite centre would have following objectives.

- Introducing people in Mauritius to the world of astronomy and making them aware of celestial phenomena;
- Offering non-formal education in Astronomy, Earth Sciences , Geography, etc;
- Providing a supporting toll for teaching of astronomy to students;
- Turning RGSC into a suitable location to hold regional conferences and workshops in astronomy and related subjects.

The Planetarium complex would have a medium size planetarium (125-seater), supported by some exhibits on astronomy and astrophysics through which visitors to the Planetarium can validate their experience. Attractive planetarium programmes would be throughout the year, supplemented by special participatory activities on astronomy.

Conclusion

The case of the Rajiv Gandhi Science Centre is an excellent example of Science Diplomacy, more precisely Science in Diplomacy, whereby professional expertise has been provided to a country with lesser experience in the field of science popularization and promotion. Some collaborations take substantial time to materialize. This is where diplomacy would play an important role; mainly in getting through with the agreements and expediting matter tactfully.

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Technology Commercialization Initiatives in the Advent of Science Diplomacy: Philippine Government Perspective



Jund Rian A. Doringo*

Introduction

The Department of Science and Technology (DOST) is dedicated in directing, leading and coordinating the Philippines' scientific and technological efforts in maximizing full potential of the country towards economic and social development. Acknowledging science and technology (S&T) as one of the major drivers for national growth, proven by research utilized by industries and policy bodies, Dost aims to strengthening ties with the public and private sectors. Consequently, the mandates ensure that the results therefrom are geared and utilized in areas of maximum economic and social benefits for the people.

Under the 1987 Constitution of the Republic of the Philippines, particularly Article XIV, focuses on S&T. It dissects its significant role in terms of economic progress, roles and responsibilities of involved sectors and other relevant matters. Section 10 asserts S&T as an essential driver for national development and progress, giving priority to research and development, invention, innovation, and their utilization, as well as science and technology education, training, and services. Section 11 details about the states' support and incentives in terms of S&T where provisions for incentives, including tax deductions to encourage private participation in programmes of basic and applied scientific research, are highly supported. Section 12 tackles with technology transfer and adaptation, which specifies regulation of transfer and promotion of technology from all sources for the national benefit. In line with this, Section 13 deals with the protection of Intellectual Property (IP) Rights, where protection and security of the exclusive

**Science Research Specialist II, Technology Application and Promotion Institute, Department of Science and Technology, Philippines*

rights to scientists, inventors, artists, and other gifted citizens for their intellectual property and creations, particularly, when beneficial to the people, for such an such period is provided by law.

The passage of the Philippine Technology Transfer Act of 2009 or Republic Act (RA) 10055 expanded DOST's function in calling for a regular national conference of government funding agencies and research and development institutes to promote multidisciplinary, joint and cross collaboration in research and development (R&D), to coordinate and rationalize R&D agenda, and to harmonize all R&D agendas and priorities.

The scope and objectives of the RA 10055 address three major components: First, it addresses technology transfer as a strategic mission of the research and development institutes (RDIs) facilitating transfer and utilization of IP and call upon government-funded RDIs to take on technology transfer as the mission to effectively translate research results into useful products and services that redound benefits of Filipinos. Second, the Act addresses transfer of technology through the management of IP rights and private sector collaboration. hence, it acknowledges that the successful transfer of government-funded R&D results depends on the proper management of IP, development of capacity by the RDI to become self-sustaining and competitive, and on enhancing interaction and cooperation with the private sector, particularly, small and medium enterprises (SME) through collaborative and contract research based on equitable, fair access, and mutual benefits for all involved partners. Lastly, the access to technologies and data establishes means to ensure greater public access to technologies and knowledge-generated from government-funded R&D, while enabling, where appropriate, management and protection of related IPs.

Efforts for Science, Technology and Innovation

The Technology Application and Promotion Institute of the Department of Science and

Technology (DOST-TAPI) has been a keen promoter of innovations since its inception in 1987. Serving as an effective and efficient dispensing body of deliverables to stakeholders and the general public, the TAPI has been a consistent ally and supporter of Filipino inventions and breakthroughs by providing assistance through grants, consultancies, and contract researches.

The Philippine government's support to science, technology and innovation (STI) through the DOST-TAPI, champions the welfare of the country's critical mass of scientific work-force and human capital by ensuring government assistance in the form of technical, administrative, and financial support.

This legal framework has created following platforms of support for inventors and innovators through cash rewards and awards for inventions, tax incentives and exemptions, invention development assistance fund, and invention guarantee fund. The application of loan assistance has been extended by government banks for the commercial production of an invention, either locally or for export and duly certified by the Filipino Inventors Society (FIS), while Screening Committee must meet the criteria in enhancing economy of the country such as profitability and viability, dollar-earning capacity, and generation of employment opportunities for Filipinos.

Aside from inventors and innovators programmes, the DOST-TAPI has also a number of need-based programmes and services under its umbrella. They include technology protection, testing, and enhancement, and technology promotion, transfer, and commercialization.

The IP Rights Assistance Programme harnesses protection of IP as a crucial preliminary step in technology transfer and commercialization in providing assistance in patent consultation and in giving grants for the payment of Patent Agents and IPO's fees. Also, the Technology Innovation for Commercialization (TECHNICOM) Programme provides holistic support to interested proponents with commercially-viable technologies through financial and technical assistance. Furthermore, the Invention-based Enterprise Development

(IBED) Programme covers pilot production, market testing, and formulation of systems and procedures considering large-scale production.

In terms of promotional activities, the Institutional Support for Trade and Exhibitions (ISTE) of the DOST Technologies and Services serves as a platform for dissemination, sharing and exchanging information and ideas involving S&T development for the benefit of different sectors.

Commercialization is the most common technology transfer pathway or modality that is practised in the Philippines for research to reach the market. The modalities of commercialization, on the other hand, include creation of spin-off or start-up companies, licensing of technology to private sector and industry, and direct sale or acquisition of the technology.

Change of Administration

DOST welcomed change when the Department transitioned from the DOST Eight Outcomes to the DOST Eleven-Point Agenda, as the government transitioned into a new administration in 2016 under President Rodrigo Duterte's Ten-Point Socio-Economic Agenda.

Authority (NEDA) recognizes important role of STI in advancing economic and social progress.

Moreover, "technology adoption allows country's firms and people to benefit from innovations created in other countries, and allow it to keep up and even leap-frog obsolete technologies".

However, there is a low level of innovation in the country owing to weak STI through human capital, low R&D expenditures, and weak linkages in the STI ecosystem. The promotion of technology adoption and innovation can ultimately provide visionary outcomes as an increase in STI utilization in agriculture, industry and services; can increase STI-based start-ups, enterprises and spin-offs by enhancing creative capacity for knowledge and technology generation, acquisition and adoption, and strengthening open collaborations among actors in the STI ecosystem.

In line with this, the Filipino values included in the DOST Eleven-Point Agenda comprise "compassion" in enhancing social fabric, "change" in reducing inequality, and "progress" in increasing potential growth; thus providing a strong foundation of an economy for inclusive growth, high-trust society, and globally competitive knowledge.

S&T initiatives contribute to the national socio-economic agenda through optimizing R&D investment outcomes, increasing competitiveness to address reduction risks brought by environmental calamities, promoting rural and value-chain development, and investing in human capital development. Thus, the DOST has been keen on implementing programmes satisfying its Eleven-Point Agenda, especially, in maximizing utilization of research and development results through technology transfer and commercialization, assistance to the production sector, and collaboration with industry, academe, and international institutions.

Translating Research to Technology Applications

There are many technologies that are transferred and commercialized through the DOST-TAPI programmes. For example, in the creation of spin-off or start-up companies, particularly from a state university or college (SUC), the Biotek-MTM Dengue Aqua Kit developed by Dr Raul V. Destura of University of the Philippines - Manila is one of the success stories.

Dengue, a disease transmitted by *Aedes* mosquito, causes a severe flu-like sickness posing lethal complications in humans. In the Philippines, it was reported that dengue had highest incidences lately. Moreover, the Department of Health (DOH) revealed 84,085 suspected dengue cases from January to August in 2016, and 372 people died from it.

This led the experts from the Institute of Molecular Biology and Biotechnology of the National Institute of Health (IMBB-NIH) to invent Biotek-MTM. This medical diagnostic technology for dengue poses opportunities for

its early detection, especially in marginalized communities, where often most cases are reported.

Commercialization and transfer of Biotek-M can pave the way for intervention to marginalized sector with its affordability and accuracy. It would also impact macro-economic growth as the development and commercialization of this very first Filipino-made medical diagnostic technology for the disease opened the door for other technologies in the field of health and biotechnology. This translates emergence of business and employment opportunities for S&T graduates in the sector, thereby contributing to macro-economic growth of the country.

Furthermore, the technology enables capacity-building through promotion of technology. The product was tested in 75 designated DOH hospitals and 25 private health institutions nationwide, and around 50 medical technologists and doctors participated in the hands-on training conducted nationwide. The team plans to capacitate about 50 doctors and 150 medical technologists and health-workers more to provide skill enhancement and promoting use of the technology. Lastly, there is an increased geographic reach when the team made negotiations for potential distribution of products to other Associations of the Southeast Asian Nations (ASEAN).

In terms of licensing of SUC-developed technology to private sector or industry, the BioGroe™ technology, developed by the team of Fe G. Torres and Ronilo Violanta, from the National Institute of Molecular Biology and Biotechnology (BIOTECH) of the University of Philippines – Los Baños, spearheaded.

Food loss occurs even before the food is placed on the table. According to the Food Agriculture Organization (FAO), more than 40 per cent of food losses are even in the production and post-production stages. Fertilizers have a crucial role in crop production and management as they improve soil fertility. The BIOTECH developed a user- and environment-friendly plant growth promoter, coined as BioGroe™, which can help increase farmers' yield in crop

production translating to increased income and purchasing power.

The technology, undoubtedly, has created a huge impact on the application of environmentally-friendly system reducing dependency on chemical fertilizers. With the reduction of dependency, the technology promotes environment-friendly system, stopping chemical leaching to fresh bodies of water and at the same time, mitigating climate change through reduced use of energy for inorganic fertilizer production.

The technology has also increased income generation; as was evidenced during technology demonstration trials. It increased income of farmers, involved co-operators through application of Biogroe™ on a per hectare basis for pechay, mustard and corn.

The project has strengthened the capacity-building of farmers and co-operators. In fact, 16 capacity-building activities (seminars and trainings) were conducted in the provinces of Cavite, Laguna, Batangas, Quezon, Tarlac, and Palawan for about 700 people to disseminate the technology at the farm level, and thereby promoting adoption of technology and capacitating target users with innovations in the agricultural sector.

As for the individual inventor-developed and commercialized technology, the Leak Sealing Valve (LSV) for Brake System of Motor Vehicle, developed by Melchor L. Heñosa of Heñosa Technologies, is a significant breakthrough. This is an anti-loose brake device attached along the brake fluid pipes of each brake assembly of wheels, particularly for public utility vehicle (PUV). It has an automatic lock system for damaged assembly, avoiding loss of brake, and maintaining driver's directional stability and control over steering. This allows control over stopping distance. The technology has promoted public safety in the transport industry. It is vital in the transport industry as well as for the security of passengers as this would lessen accident rate by loose brakes.

In the efforts of addressing pressing national concerns on disaster risk reduction (DRR) and

climate change, significant projects have been developed – such as the National Operational Assessment of Hazards (NOAH) and the Nationwide Disaster Risk Exposure Assessment for Mitigation (DREAM). These green technologies advocated by the Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD), make real-time weather predictions for easy access. In turn, citizens are empowered in making critical, life-saving decisions, including investments taking into consideration accurate weather scenario.

Furthermore, the Filipino-made Automated Guide-way Transport (AGT) provides alternative, efficient and cost-effective transport model for fast and reliable mass transport system in the country. The AGT addresses environmentally sustainable transport system in resolving greenhouse Gases emission. The technology has recently been adopted by the Philippine National Railways (PNR) to connect suburban areas closer to Metro Manila. Other notable green technology breakthroughs are on the rise with Philippine Nuclear Research Institute's (DOST-PNRI) disposal system in isolating waste from the environment; controlling releases of radionuclides and reducing obnoxious releases. A number of outstanding researchers and inventors are the beacon of hope in becoming game-changers in their respective fields – worthy to mention are works of Dr. Arturo Alcaraz in geothermal energy development; Dr. Ramon Barba in mango farming research and tropical tree physiology; and Dr. Fe Del Mundo, in inventing an improved incubator and jaundice relieving device, to name a few.

Science Diplomacy for Technology Promotion, Transfer, and Commercialization

The effort of each economy, especially of developing countries, in practising responsible entrepreneurship through the development, adoption, and commercialization of technologies as a means to uplift social and economic development as far as science and technology initiatives are concerned is noble in different ways.

With the launch of the Sustainable Development Goals (SDGs), covering a broad range of social issues primarily on poverty, hunger, health, education, climate change, gender equality, and social justice, it is but timely to establish a science diplomacy in reaching multi-sectoral collaboration and partnerships in an international scale through sharing of information, procedures and policy recommendations among various stakeholders. Through communication platforms, dialogues become a unique global getaway of information management and generation on various tools and mechanisms to support partner countries to achieve the SDG targets.

In the Philippines for example, as revealed in the Fifth Progress Report on the Millennium Development Goals (MDG) in 2014, published by the NEDA and the United Nations Development Programme (UNDP), there are a combination of misses and hits towards fulfillment of targets. Data showed that there was a slow progress in reducing extreme poverty in the country while universal access to primary education was likely to be achieved. The Philippines has already reached the target for basic sanitation, including access to safe water, and this could imply a faster progress as the people and the government would have more resources to meet needs.

With the international collaboration, such as the Asian and Pacific Centre for Transfer of Technology (APCTT) of the United Nations (UN) Economic and Social Commission for Asia and the Pacific (ESCAP) together with other institutions or organizations in the public or private sectors, there is a mean to deliberate on the international best practices and lessons learned in the adoption, adaptation, and development of technologies in fostering economic development. Subsequently, this facilitates the needed pondering on strategies to ensure sustainable management of natural resources and balancing of the social, economic, and environmental dimensions of development, especially on the new and emerging technologies, such as renewable energy and nanotechnology.

It is helpful to establish a process of technology strategies and transfer to meet global standards, and to build infrastructure for technology growth

among partner countries that can be attained from endless negotiations and compromises built by science diplomacy. Among others, the member-states can be advised on the formulation and implementation of the technology transfer, promotion, and commercialization programmes of work as well as needed logistics and financial status.

Moreover, through science diplomacy initiatives, the programme of work can develop more project collaborations with relevant industry players, which would strengthen capacity of STI and would enhance sharing of information for technology adoption and commercialization by member- states.

Recommendation and Conclusion

The Philippines has the necessary legal and policy framework to ensure development, exploitation, protection, transfer and utilization of technologies, which the structure and dynamics of the government agencies, involved in the S&T services, are designed to provide holistic and complete approach to technology, from the development of research ideas, to testing and enhancement, to commercialization and promotion.

The necessary programmes of the Philippine government on such transfer of technologies are in-line and adaptive to the needs of target beneficiaries in terms of stage of technology development and sectors involved. Since there are available modalities for transfer and commercialization of technology, and technology transfer landscape in the country is emerging, lessons from past experience must be considered.

The discussions fuelled by social and scientific mobilization would help create investments in technology transfer and commercialization, necessary in uplifting micro, small and medium entrepreneurs of the Asia and Pacific Region

through science and technology innovations for a productive population as support to achieving SDGs with science diplomacy at the very centre of the mechanism. International Collaborations within key economies can provide added value to the national strategies such as proactive engagements, S&T gaps mitigation, and people-to-people contact as tool for public diplomacy. At such a point, the pathways into which economies come into as an agreement through science diplomacy, whether through technology diplomacy, technology synergy, or technology acquisition, a harmonious mutual relationship can be established for stronger partnerships.

If only this kind of endeavour can be advocated in the international level with robust technology in helping other partner's economic growth by advocating innovative culture, then nothing is impossible.

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Impact of Science Diplomacy in Privatization of Energy Sector in South Africa



Siphesihle Intelectual Manqele*

Introduction

The recent misgivings at South African sole electricity public utility company, Eskom, leaves everyone concerned on what South Africa should do for ensuring its return back to good old glory days. One of the methodologies was to rescue Eskom through full or in-part denationalization. Following this resulted in financial woes, which have triggered deliberation on the alternative viable approach in trying to solve conundrum of the South African state utility company, and the government is lately dealing with.

A 2016/17 report analyzing Eskom's financial position revealed that the State-owned utility was not generating enough cash from its operations and electricity sales to cover interest on its borrowings, which has been predicted to reach around R500 billion in the three forthcoming years. The utility company has been involved lately in a fight to counteract phenomenon through tariff hikes. However, it has been argued that a return to sustainability lies not in higher tariffs, but in eliminating unnecessary expenditure, reducing employee costs and extending short-term support to electricity intensive businesses at the risk of being forced to cut production owing to rising power costs (Creamer, 2017). An analyst at Eton Group Nicholas Saunders equates Eskom position as the position of using one credit card to pay off another. It also warns that there is a growing risk that government may have to provide future equity, or provide further debt guarantees.

The financial consequences of poor planning and management are pointed out as the causes underpinning protracted current financial trouble at Eskom. The unnecessary expenditure and

**Senior Policy Analyst, National Treasury, South Africa*

implementation of political agendas have caused massive inefficiencies for the company that does not have the luxury of benevolence. To summarize the financial state at Eskom, employee head-count has increased by 45 percent since 2007/08, and has remained above 47 000 despite energy available for distribution being flat over the period. The total energy available for distribution, coupled with decline in sales, raises concerns regarding level of overstaffing at the utility. Although Eskom ended its 2016/17 financial year with a positive cash balance of R19.9 billion, but the situation would have been much worse if had not been supplemented through new borrowing of R51 billion. Therefore, this is a warning sign that the utility's debt repayment profile is poised to become massively unbearable in future.

Interestingly, this sustainability warning is also echoed in a macroeconomic scenario included by Eskom in its recent application to the National Energy Regulator of South Africa (Nersa) for a 19.9 percent tariff hike as from 1 April 2018. In one of the scenarios, produced for Eskom by Deloitte is if Eskom receives an 8 percent increase next year with the revenue shortfall being funded by raising additional government debt. The simulation shows that this would lead to a marked deterioration in government's Budget balance and that government's debt to gross domestic product (GDP) ratio would reach 75 percent by 2021 and 104 percent by 2030. By contrast, under the 19 percent tariff scenario, the debt to GDP ratio would stabilize at around 66 percent.

The essence of Eskom problems lies simply on the company being faced with a steadily increasing surplus supply of electricity, which is expected to grow even more over next five years; this would be compounded by erection of the new Medupi and Kusile power stations. The key financial problem that confronts Eskom is, therefore, stagnation in consumer demand, and a steady growing surplus of electricity. This growing supply would be produced by very expensive new power plants, which are financed through debt, and which need to be serviced. The total costs for Medupi and Kusile are R145bn and

R161bn, respectively; their completion is set to be in 2020 and 2022, respectively.

The financial consequences of poor planning and management are very clear in Eskom. A large surplus in electricity supply and much lower forecast demand over many years to come, together with mentioned financial issues, have hindered planned construction of new nuclear power stations for a very long time. With this, it is clear that a different model is needed to counter issues faced by energy utility company and the government as whole; hence, the exploration is of the idea of privatization for this state-owned entity.

Science diplomacy in energy sector privatization

Science diplomacy is defined as the use of scientific collaborations to address common problems and to build constructive international partnerships among willing sovereign countries. Science diplomacy can be furcated into three interrelated activities as follows:

- Science in diplomacy - Informing foreign policy objectives with scientific advice;
- Diplomacy for science - facilitating international science cooperation; and
- Science for diplomacy - using scientific cooperation to improve international relations between countries.

The envisioned privatization of state-owned South African utility or Energy Company falls within the ambit of the first form of science diplomacy, Science in diplomacy. This proposed initiative infers for government policy shift, and thus it requires proper research and feasibility studies to be undertaken in assuring proper decision-making and implementation. To contextualize, the above has exhibited lengths and depths of the SA utility company current financial problems, which has triggered a different approach in the sector. The question, therefore, is about how science diplomacy can be of use assuming the approach undertaken?

Science in diplomacy

The scientific advice, especially through partnering with foreign countries which have been in a similar situation, can advise SA on how better to go about in ensuring that no rush or haphazard decision is taken with regard to proposed denationalization. Moreover, such sought-out scientific advice can be further used in making sure that terms of reference (TOR) and other guidelines to implement the privatization process are all inclusive and cover all requirements that the government as shareholder wants and expects from a potential business partner poised to take over furnishing of this very important task of generation, transmission and supply of electricity to people of the country.

Countries to partner with

From the global perspective, the principal driving force of energy sector privatization reform as described by many authors comes from, poor performance of state run electricity sector and inadequate expansion of access to electricity service for population, inability of state sector to finance needed expenditures on new investment and or maintenance, the need to remove subsidies to the sector to release resources for pressing public expenditure needs, and desire to raise immediate revenue for the government through sale of assets from the sector.

The evidence points out that the energy privatization reforms have had largely been experienced in Europe, Asia and to a lesser extent to South America. Countries such as Chile, England and Norway are seen as pioneers of energy sector reform; these are the countries which initiated the move and successfully implemented it.

Nature of scientific advice

Privatization has been one way of helping government deal with its ailing state owned entities such the ones in the energy sector. However, sudden interest recently in renewable energy makes everyone wonder whether this still is a viable solution. Renewable energy is among

the top emerging technologies; being considered by to help address power and cooling costs, according to a Mortenson survey of corporate data center executives. Eighty-four per cent of respondents felt that there is a need to consider renewable form of energy, such as wind and solar, to manage future needs, according to the survey (Snyder, 2014: online)

Therefore, as much as privatization is a supposed approach of resurrecting ailing state-owned entities, it appears at same time a short-term solution to energy sector woes, hence an interest to renewable energy. There are a number of promising technologies, which will drive energy efficiency forward in the next few years; and renewable energy increasingly makes economic as well as environmental sense for the energy supply chain. With costs dropping and operating efficiency rising, renewable energy is rightly an attractive venture. For example, Snyder (2014) mentioned that cost for producing energy from wind has decreased by 58 percent and solar power by 40 percent in the past five years, and they would continue to fall, making renewable sources more cost-competitive compared to traditional fuel sources in many of the markets. At the same time, availability is steadily improving. Wind farms, for example, generate power 50 percent of the time lately, up from 35 percent in 2007. Therefore, consultation with countries or international agencies advocating renewable energy needs to be undertaken while implementing privatization process in the energy sector; as pointers are visible that the future of coal-generated electricity is certainly dwindling, and thus a strong energy mix looks to be a long-term solution.

Literature review on the privatization of the utility sector

In broader context, literature reveals a widespread existence of privatization in the energy sector, dating back as early as 1980s; identifying Chile, England and Norway as pioneers. However, it is starkly clear that science diplomacy was not

considered in such initiatives, perhaps, owing to causes of unsatisfactory outcomes on cited below literature reviews. It was all based on curtailing financial defiance's without integrating element of scientific solutions. Vlahinic (2011) alluded that privatization in developing countries of the electricity sector has been undertaken as a final modification step that was not necessarily connected to liberalization process and the most controversial one was due to the huge economic and strategic importance of electricity sector for national economy. The results reveal the relationship between privatization and improved performance, and it was clear for industries operating in competitive markets, but evidence was vague for natural monopolies, like electricity that operates in non-competitive markets.

Developing countries with high budget deficits, and high public and external debts when decided to privatize loss-making electricity enterprises to decrease imbalances, the results were far worse; resulting in output losses such as increased unemployment and high economic and social costs.

Consider the Southeast European countries as reference that have undertaken privatization in electricity sector with the same goal of encouraging foreign direct investment into the sector and for allowing market liberalization and increasing competition thereby optimizing efficiency. Hashini *et al.* (2015) talked on the lesson learned on Kosovo privatization in the energy sector. They said that success of electricity privatization was found mostly dependent upon the other prior sectors restructuring such as a transparent and effective regulatory framework and appropriate market conditions for investors to enter the market. Kosovo, Bulgaria, Romania and Macedonia have privatized complete distribution network, while Croatia, Serbia and Bosnia and Herzegovina are still in the initial phases of privatization process. All these countries are small economies, and they face significant economic constraints related to their limited market size and capacity. The systemic constraints are related to physical size of their electricity systems as they are too small to be divided up into several competing firms.

Privatization in South Africa

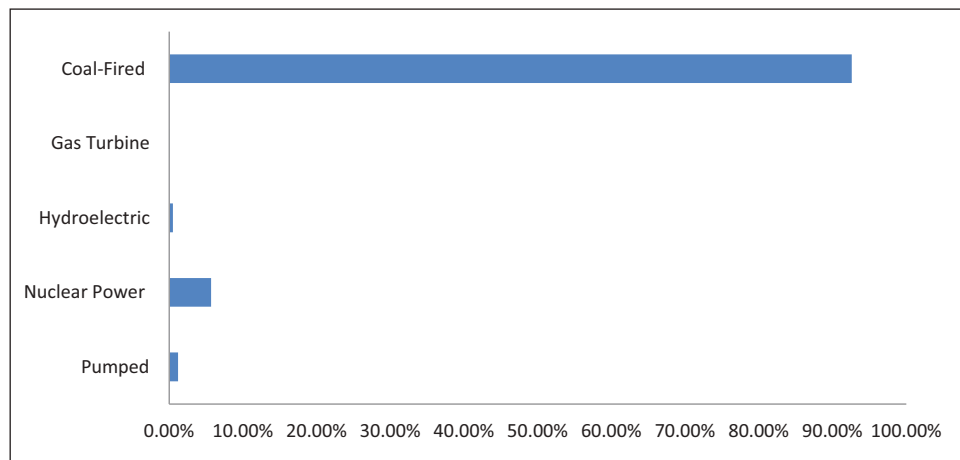
The idea of the proposal as outlined at the beginning is rooted on consistent difficulty of maintaining the financial health of the country's sole electricity provider. It has been mentioned that lack of planning and mismanagement of funds, inefficiencies, alleged fraud and lack of good governance are the issues compounding the financial woes in the entity. However, problems seemed too deeper. The prognoses of the state of affairs at the country's electricity provider are seemingly by privatization, but by proper diagnosis of the problem faced by the country as far as energy is concerned.

The other element that has been cited as an incremental factor into Eskom problems is the lack of proper energy mix in South Africa; for instance many countries have recently invested heavily on renewable energy as another option to energy or electricity generation. Research has provided that renewable energy tends to be cheaper and practical to implement (Snyder, 2014: online). In addition to that, in the beginning it was mentioned that other challenge faced by country's electricity provider is the shrinking electricity demand, especially from the corporate sector. The insinuation is that corporates lately prefer to operate in countries which are offering other forms of cheaper sources of energy, such as renewable energy. With that said, it appears that it is clear to everyone including South African government that the current situation in the electricity sector requires many innovative interventions, for example moving with times by investing in other avenues other than the traditional coal generated electricity. Currently, the South African government is in the process of implementing nuclear energy programme.

Energy distribution in SA

At present, the country produces 250 TWh – 229 TWh from coal, 12 TWh from nuclear, 4 TWh from solar and wind, and 4 TWh from hydro. In 2017, the country imported 13 TWh and exported 15 TWh. Consumption was 198 TWh, or about 3600 kWh per capita.², Eskom supplies about 95 percent of South Africa's electricity and approximately 45 percent of Africa's. Of its total installed net

Figure 1: Electricity Production in SA



capacity of 40.5 GWe (44.2 GWe gross), coal-fired stations account for 34.3 GWe and nuclear for 1.8 GWe.

SA government announced in 2006 that it was considering building further a conventional nuclear plant. And in 2007, the Eskom board approved a plan to double generating capacity to 80 GWe by 2025, including construction of 20 GWe of new nuclear capacity so that nuclear contribution to power rises from 5 percent to more than 25 percent and coal's contribution falls from 87 percent to lesser than 70 percent. The new programme would start with up to 4 GWe of PWR capacity to be built as from 2010, with the first unit commissioned in 2016.

New and Renewable Energy

Government is committed to diversifying its energy mix, and this includes introduction of renewable energy at a large scale. SA is relatively in infancy in its renewable energy industry. The renewable energy is forecasted to contribute a total of 18.2 GW by 2030: Wind – 8.4 GW; Solar PV – 8.4 GW; CSP – 1 GW ;Other – 0.4 GW

Recommendations

They are from reviewing past experiences of the countries that have implemented privatization in the energy sector.

- The past experiences show that there is a greater need to take cognizance of science diplomacy in trying to find solutions especially where science is involved. The literature above

exhibited failures in attempt to privatize utility/energy companies as the result of narrow focus on the financial inefficiencies while broader issue was on finding science-related solution to deal with ailing state-owned companies;

- What we have learned is that by working with other countries through science diplomacy, the solution would have been looking at other tried and tested alternatives of energy generation rather than focusing solely on privatization; and
- Lastly a proper study needs to be undertaken first and foremost to determine a proper root cause of the problems within the existing methodology used by the country in electricity generation and its distribution; for example the proposed privatization might not yield anticipated benefits as it is not compatible with the problems faced, i.e. the root cause might have been the inadequate energy mix in the country.

Conclusion

To conclude we can deduce that privatization is one of the methodologies that have been used as a turnaround strategy, both in public or private sector. With no exception many sovereign countries have used the aforementioned in trying to turnaround their ailing state-owned entities; specifically to their monopolized state owned utility or electricity companies. Looking at the empirical evidence before us, it is clear that there

is correlation between privatization and improved performance (efficiency); however, there is no clear correlation in businesses operating within natural monopolized sectors such as electricity or energy.

To reiterate the point that has already been made about Eskom is that, the position the entity is facing is underpinned mostly by their poor planning and mismanagement of funds; unnecessary spending and implementation of political agendas have caused massive inefficiencies for the company. Therefore, in another sectors we have to be sure that privatization shall bring new leaf of life that is sought in the state- owned entity as evidence proves that it has an ability to convert an inefficient business to a well run and self –sustaining one. But as mentioned, there is a doubt of that effect in monopolized industries or sectors that similar results can be yielded. In many developing countries, such as South Africa, it turned out that privatization improved microeconomic efficiency to the selected few related parties, for example the government. In addition, the developing countries with high budget deficits, high public and external debts, who have decided to privatize loss-making electricity enterprises to decrease or rectify the mentioned phenomenon, the results were far worse; output losses such as increased unemployment and high economic and social costs.

With that said what we have learned to see as a caution for South Africa in insuring that same fate is not experienced should it go ahead with the privatization process. This is where the role of science in diplomacy is needed the most, meaning tackling science related problems with informed scientific advice through a collaboration with science diplomacy partners or countries. Especially considering that the evidence before us reveals that inefficiencies are not the only obstacles that Eskom needs to overcome to return to its old glory days. This is because figures are showing a dwindling electricity demand of a traditional coal generated power as opposed to other sources such as renewable energy for simple reason of being much affordable; which is provided by the aforementioned company.

The alarming fact that other countries are investing in other sources of energy such as renewable energy and such sources seem to be affordable indicates that maybe South Africa should also start investing heavily on them rather than pushing to bail-out the ailing state owned entity all the time. With no empirical evidence, it is fair to say that Eskom has significantly crippled the country's fiscus and is expected to do so in future if strong forward looking innovative interventions are not put in place.

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Science Diplomacy in Promoting Agricultural Research and Development in Tunisia



Sihem Soufi*



Sawsen Ayadi**

Introduction

Tunisia is one of the countries forming the Maghrib, the western part of North Africa. It is situated on the northern coast of the continent of Africa with an area of 164,000 square km. Tunisia is among the most westernized state in North Africa.

The national language adopted is Arabic. Before the Arab conquests, Berber was the chief spoken language. Arabic is a Semitic language, related to Hebrew and Aramaic. It is spoken almost universally in Tunisia. After the independence, the Tunisian government reintroduced Arabic, but it maintained its use of French. French is still widely spoken in Tunisia and is consistently used in science, the military, international trade and foreign diplomacy.

Tunisia has adopted the French educational system, which has three levels. First, there is a six-year primary-level programme to be attended by all students. They must pass a major test at the end of their sixth year to enter secondary school. After three years of general education, each student specializes during the final four years of high school. Students who do not go to the third level may enroll in three-year vocational programmes. All schooling, even at the university level, is free. This includes books, school supplies, uniforms, and meals. Classes are in French and in Arabic, with increased emphasis on Arabic. The Tunisia universities were founded by the government to give students the technical knowledge and training needed to engage with rapidly changing global community.

**Post-Doctoral Early Stage Researcher, National Agronomic Institute of Tunisia, Tunisia*

*** Assistant Professor, Tunisian National Institute of Agriculture, Tunisia*

National Tunisian Policy in Higher Education and Scientific Research

Considering the vital role of the Higher Education and Scientific Research to support Research and Development, the scientific research and development has been placed on a higher pedestal in Tunisia; it is one among Tunisian national priorities. This fact is confirmed by the government's decision to progressively increase expenditure on R&D.

Given this political will, during recent years, The Ministry of Higher Education and Scientific Research (MESRST), has shown significant developments on the level of structures, programmes and objectives, contributing effectively to global and sustainable national development country by participating in diversification of productive activities, reinforcing competitiveness of national firms and creating better opportunities for job-creation.

The Ministry represents an essential turning point for the promotion of R&D sector. The policy undertaken by it is relying on young researchers as the source of national wealth and pillar of the country's future. The gate of knowledge and improved employability are open to secondary school graduate to have access to the university. The MESRST is seeking for integration of the country to be participant of global economy. The Ministry is responsible and supervises the national programmes of scientific research. Through a specific research Directorate-General, it supports execution of research programmes inside research laboratories and units through softening of procedures outlining the use of allocated funds to scientific activities of these structures. Other relevant tasks are: promotion of innovation and technological development by supporting innovative firms and underlining the results of research, strengthening partnership between research structures and firms, and giving birth to an ambitious programme for setting up of techno-parks and incubators.

The MESRST aims towards the mobilization of financial resources coming from the public and private sectors, and also through international

cooperation to benefit the sector. It is also involved in the adoption of measures that would further involve Tunisian scientific competencies abroad in identification, execution and evaluation of research programmes of priority. Finally, through the International Cooperation, the Directorate-General participates in research and innovation policy dialogue within MoCo. The organization is operating as InP (Information Point) since the Spring of 2005 within the framework of the Euro-MEDANet project. Also the organization is partner in several EU projects. It participated within the frame of FP6 in EUROMEDANET, FOODNCO, promedaccess, IDEATLIST and ERAMED. In FP7, MESRST coordinated bilateral project ETC, and was an active partner in MIRA, MED-SPRING, ERANETMED, ARIMNET2. The MESRST is the national contact point for the INCO programme within the Seventh Framework Programme.

Science diplomacy to reach sustainable agriculture goals

Tunisia achieved independence from France in 1956, and it placed great emphasis on agricultural research and education. Several institutions pursue agronomical science and biotechnology – five public, seven higher education, five inter-professional and two private ones. There has been an increase in numbers of agronomist scientists, and especially biotechnologists, since 1980s, and qualification status of the country has improved. Agronomical research budgets have risen steadily.

To enhance Tunisian agronomic research programmes, staff training needs to be strengthened, especially in use of science for diplomacy. Collaboration is good, but benefit could be gained from better linkages among numerous national agencies engaged in agronomic research, possibly through a central mechanism.

The most important purpose is that to enhance cooperation with European States as well as American and Asian countries to accelerate the pace of development of national agriculture.

Tunisia has extensive dryland agriculture; where salt, drought and heat are often severe besides many biotic stresses affect wide range of crops. For wheat, barley, grain-legumes and vegetables, numerous crosses have been made and segregating populations could be generated. For other crops, line evaluations have been done at several sites.

Bridge between diplomacy and science

For promoting science diplomacy in Tunisia, first of all we need to build an environment conducive to science-policy interaction, including cross-sensitization of scientists and politicians, and recruitment of science advisors to work with policy-makers. It is necessary also to develop a regional charter for best practices and ethics in research, technology transfer, and science diplomacy in general.

Organizing science communication workshops or trainings on the communication of science would have a big impact to promote science diplomacy. It appears that with the emphasis of tunisian agricultural development cooperation in Africa, currently placed so strongly on productivity and technological modernisation, alternative farming from within tunisia's own agrarian and social policy debates have been left behind as the country makes its leap into Africa.

International science diplomacy

The institutional framework governing Tunisian development cooperation is characterized first and foremost by significant fragmentation. This is in part due to the nature of Tunisian cooperation, particularly its technical assistance dimension, which entails transfer of Tunisian's

own experiences and expertise of its institutions across an array from science and development to politics. There are, therefore, great numbers of institutions – public and non-public – directly involved in the implementation of technical cooperation projects, raising considerable coordination challenges.

In close collaboration with its international network of Partners, the Tunisian gathers a large array of skills and actors (decision-makers, professionals, teachers, researchers, civil society) for developing solutions; combining know-how with the international dimension of teams.

Tunisian cooperation actions mainly focus on:

- Developing rural territories
- Developing agri-food chains and industries
- Supporting decision-making
- Building observatories and information systems
- Supporting capacity-building and governance
- Implementing sustainable management of natural resources
- Enhancing institutional cooperation

Conclusion

Tunisia is a small country but we have science agreements with almost all countries. The problem is that the public, or even scientists, are not aware of these activities unless they are involved. Consequently, we really need to make these collaborations more well-known to scientists, researchers and the public.

A key objective at present is to expand the number of countries engaged in science diplomacy and expand the list of successes. To do that, support from policy-makers and the public is critical. More support can be converted to generate more impact.



India-Uganda Collaboration on Fertilizer use by Farmers In Uganda



Kasande Glorious*

Introduction

A landlocked country in the east-central Africa, situated north and northwest of Lake Victoria, Uganda has a total area of 236,040 sq km (91,136 sq mi), of which 36,330 sq km (14,027 mi) is inland water. It extends 787 km (489 mi) north-north-east-south-south-west and 486 km (302 mi) east-south-east-west-north-west. Bounded on the north by Sudan, on the east by Kenya, on the south by Tanzania and Rwanda, and on the west by the Democratic Republic of the Congo (DROC), Uganda has a total boundary length of 2,698 km (1,676 mi).

Population

According to Uganda National Housing and Population census 2014, Uganda Population was 34.6 million people. Annual population growth rate between 2002 and 2014 censuses was 3.0 per cent. In 2014 population density was 173 persons per square kilometer. Sex Ratio was 94.6 per cent in 2014.

Economy

Uganda is agriculture based; employing over 80 percent of the population in agriculture and generating 90 percent of export earnings. Coffee is the main export crop, with tea and cotton, being other agricultural products. The country also has mineral deposits of copper and cobalt, which contributed to 30 percent of export earnings during 1960s, although the mining sector is only a minor contributor to the economy lately. In 2008, Uganda officially declared that it had oil reserves in the Albertine region; this oil is due for mining and processing and the process commenced in 2017.

Background of Agricultural Sector

Agricultural sector is the most important sector in African economy. Firstly, more than 70 percent of the active population of the sub-Saharan Africa is employed in agriculture. Secondly,

* Senior Researcher, Praid Consultants Ltd., Uganda

it contributes more than 46 percent to gross domestic product (GDP), and thirdly, it is the main source of foreign exchange earnings.

In Uganda, agriculture sector contributes in following ways: Agriculture is and will, in the medium-term, remain central to Uganda's economic growth and poverty reduction. It employs nearly 80 percent of the population, contributes approximately 25 percent to the Gross Domestic Product (GDP), and generates 40 percent of country's exports. The sector's role is well articulated in Uganda's long-term development aspirations in Vision 2040, which envisions transforming Uganda from a predominantly peasant and low-income country to a competitive upper-middle-income country. Achieving this would require enhancing production and productivity within the sector through the use of productivity-enhancing technologies such as use of fertilizers. It is the source of raw materials for the industrial sector through forward and backward linkages with the service and industrial sector (NDP, 2010). Therefore, development programmes, key policy players, governments and researchers need to put into consideration the agriculture sector as the backbone of the Ugandan economy.

Despite contributions of the agriculture sector, agricultural development remains a challenge in Uganda with a little attention to the challenges facing in the sector. There has been a noticeable decline in food production, increase in poverty level, higher malnutrition and vulnerability to shocks (Government of Uganda, 2011). The above challenges are owing to the following reasons – limited land for cultivation due to high population pressure (Arellane and Lee, 2003), insecure land tenure system that has limits farmers from acquiring land for cultivation (MAAIF, 2010), poor climatic conditions (Ajayi, 2009), low soil fertility (Mugwe, Thomas, Isaac, and Minde 2009). These need to be addressed to enhance crop production to fight food insecurity.

Declining Soil Fertility

Low soil fertility has become a matter of concern by development workers, researchers and soil scientists, and it has been identified as a major constraint to food production in Uganda.

Adoption of soil fertility technologies appear to be the most appropriate way of enhancing declining soil fertility in the country (Maria and Yost, 2006). Fertilizer refers to any substance containing one or more recognized nutrient(s) used for plant nutrition, and is designed for use or has value in promoting plant growth (National Fertilizer Policy, 2016). The Agro Ecological Zones (AEZ) of Uganda are characterized with low organic matter and nutrient contents (Maria and Yost, 2006). The problem of low organic matter in the soil and declining soil fertility have worsened by limited or no use of external inputs such as use of organic and inorganic fertilizers.

The related Abuja Fertilizer Summit 2006 Declaration recommended that African countries should apply at least 50 kg of nutrients per hectare by 2015 to attain and sustain the Comprehensive Africa Agriculture Development Programme (CAADP) target of 6 percent annual growth in the sector (African Union, 2006). Uganda is far from achieving this target and its losses of soil nutrients remain one of the highest in Africa. To reverse the situation, the Government must address the constraints of the development of fertilizer sub-sector.

The fertilizer market remains underdeveloped and fragmented, and has persistent gaps in legal and regulatory frameworks; thus, the need is for a policy framework that harmonizes and streamlines operations of all actors in the fertilizer subsector. Secondly, because of different challenges in accessing fertilizers, the government of Uganda should consider having policies encouraging country to make collaborations with other governments/countries in fighting the challenge of low fertilizer -use by farmers. There are governments, like Indian government, having friendly foreign policies. Uganda can go into a 50-50 partnership with them whereby the collaborations allow easy access and utilization of fertilizers.

Essential Use of Fertilizer for Increased Crop Production

Recognition of the use of fertilizers as the most viable mechanism for bolstering soil and general agricultural productivity cannot be over-emphasized. Its potential impacts include: reduced

malnutrition, high income from high yields, and contribution to export strategic agricultural commodities. To enhance agricultural productivity towards the CAADP target, the Abuja Fertilizer Summit (2006) declared that all African countries should increase their fertilizer application levels to at least 50 kg of nutrients per hectare per year by 2015 (African Union, 2006). The most limiting nutrients in Uganda soils are nitrogen and phosphorus. A recent study on Uganda recommends raising phosphorus nutrient to at least 200 kg of nutrients per hectare per year. Ugandan soils were renowned for their high fertility. The depletion of soil nutrients is continuing at an exponential rate, not recorded elsewhere in the world. Uganda loses approximately 80 kg of nutrient per hectare per year through top-soil erosion and nutrients' depletion through harvested crop biomass. Given the high population that depends on agriculture and growing population pressure, if no action is taken, the soils are likely to lose more nutrients. This will result in worsening nutrient imbalances, since only limited deliberate efforts are being made to replenish soil nutrients by using organic, inorganic and bio-fertilizers to sustain and enhance soil fertility and increase food and other crop production. Of the estimated losses of 80 kg of nutrients per hectare per year, farmers are adding only between 1 and 1.5 kg, recording Uganda the least fertilizer use country in the whole world. This rate is below the average of 8 kg per hectare in Sub-Saharan Africa (SSA). As a result, soil fertility decline is one of the binding constraints to agricultural growth in Uganda. Recent studies have revealed that the major challenges that contribute to low use of fertilizer (organic, inorganic and bio-fertilizers) are related to enabling environment, supply and demand factors.

The enabling environment of the fertilizer sub-sector is affected by, amongst other factors, volatility in exchange rate, commodity pricing, marketing, trade and tariffs, financial arrangements, regulatory functions, and research and extension. For example, the importation of inorganic fertilizers is a capital-intensive venture. Importers and agro-dealers as well as farmers lack access to affordable finance to facilitate fertilizer trade and use. High interest rates (over 20 percent) and stringent collaterals act as disincentives to fertilizer market development. Uganda is a signatory to the East African Community (EAC)

zero-rated tax on fertilizers. However, fertilizer imports attract 6 percent withholding tax (WHT) and sales in excess of US\$1 million. Whereas the importers and agro-dealers are entitled to reclaim this tax when they submit their annual tax returns, this does not happen in practice. Instead, the tax is passed on to the farmers, thus further raising price of fertilizers. On the supply side, importers trade not only in small lots due to limited capital but also from far-off places such as Ukraine, Turkey, and China. This, coupled with the high transport cost from Mombasa to Kampala, inevitably further increases the price of fertilizers to farmers. In addition, range of the fertilizer products available in the market are limited. This limits farmers' choices based on the nutrient requirements in different circumstances. Smallholder farmers lack capacity and knowledge on how to replenish lost soil nutrients. There are also challenges associated with the limited awareness of the value and use of fertilizers, low purchasing power, poor supply of fertilizers, and prevalence of counterfeit/fake fertilizers that are not detected by farmers. There is also a myth that Uganda's soils are fertile (as recited in the National Anthem), and do not require fertilizers, while still others have the erroneous perception that fertilizers "spoil" soils.

The current high rate of nutrient depletion with very low replenishment rates is likely to threaten Uganda's food security, income security and export competitiveness. On the one hand, this is due to demand-depressing effects of unfavorable price incentives aggravated by several factors, such as affordability (mainly for smallholder farmers), counterfeit fertilizers on the market and a general lack of information about the availability and cost of fertilizers. On the other hand, the limitations of the supply side include low levels of private investment in fertilizer distribution, which may be due to high transportation costs, attributed to inadequate infrastructure and high cost of financing. Currently, the emerging input markets remain underdeveloped and fragmented, and access to inputs, especially fertilizers, is a challenge for smallholder farmers. Developing a phosphate industry in Tororo is one of the core projects identified in NDP II and NAP and represents a long-term strategy to address availability of fertilizers in Uganda.

Accordingly, the National Agriculture Policy (NAP) envisions “a competitive, profitable and sustainable agriculture sector” with the objective of promoting food and nutritional security and improving household income. Among the complementary actions by other supporting sectors, NAP, for example, underscores that the Ministry responsible for mineral development shall promote investment in local manufacturing of fertilizers to increase access to the quality and affordable fertilizers necessary for increasing agricultural production and productivity.

Within the NAP framework, MAAIF has developed the ASSP with the mission of transforming the sector from subsistence to commercial agriculture. One of the four priority objectives of the ASSP is, “increasing access to critical farm inputs”, within which enhancing access to and use of fertilizers for all categories of farmers is a strategic intervention.

How Uganda promotes science

Uganda is working in collaboration with other international organizations and governments. These include Uganda collaboration with ASARECA, International Fertilizer Development Centre (IFDC), International Institute of Tropical Agriculture (IITA), Private Sector and CSOs to advocate for and pursue harmonization of fertilizer related policies and regulations in EAC. The National Agricultural and Research Organization of Uganda developed the Fertilizer Optimization Tool (FOT) which has of recent attracted international attention. The FOT helps farmers to make informed decisions based on the available resources like land, money, and type of crops to be cultivated. This tool was tested and found applicable and efficient in promoting fertilizer -use among farmers. The tool is currently being implemented in East and Central parts of Africa.

The need for International collaborations

The people especially the youth need to have a strong orientation for science and technology, right from childhood to have solutions to future problems of science and technology. The young should take science and innovation courses right from the primary level. The aspect of innovation in India is considered a great priority in promoting science and technology. The Indian government has a strong example of

the countries, which have invested in research and innovations for science and technology. Uganda should likewise have such priorities to develop innovative technologies; and empower both government and private sectors in research and development institutions like the NARO, Universities, and private sectors. There is a need for the government of Uganda to improve budget on science and technology and innovations to promote research and development for good technology innovations in the country.

There is also need for the government to create strong international collaborations in dealing with the cost and in availability of fertilizers, especially nitrogen fertilizer, given its key role in improving crop production. Governments, like that of India, have developed a number of soil fertility management nitrogen inclusive technologies. The Ugandan government can collaborate with the Indian government.

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NOTES

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Core IV-B, Fourth Floor, India Habitat Centre
Lodhi Road, New Delhi-110 003 India., Ph. 91-11-24682177-80
Fax: 91-11-24682173-74, Email: dgoffice@ris.org.in
Website: <http://www.ris.org.in>

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