SCIENCE AND TECHNOLOGY FOR SOCIETY FORUM

SRI LANKA 2016

EXECUTIVE SUMMARY

07 September 2016
NELUM POKUNA MAHINDA RAJAPAKSA THEATRE
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WATERS EDGE

Ministry of Science Technology & Research
3rd Floor, Sethsiripaya, Battaramulla
Sri Lanka

EXECUTIVE SUMMARY

The **Science and Technology for Society Forum Sri Lanka 2016** is an outcome of the visit of Hon. Ranil Wickremesinghe, Prime Minister of the Democratic Socialist Republic of Sri Lanka to Japan in November 2015, to attend and deliver the keynote address at the 'Science and Technology in Society Forum 2015' in Kyoto, Japan. The Forum was convened by the Ministry of Science Technology and Research and the United Kingdom – India Education and Research Initiative (UKIERI), in collaboration with Japan-Sri Lanka Innovation Platform (J-SLIP) coming under the purview of Prime Minister's Office.

The main objectives of the Forum were to foster excellence in Science and Technology and introduce advanced technologies to Sri Lanka's Industries and infrastructure development programmes and integrate Sri Lankan industries into global value chain. In order to achieve the above objectives the Forum addressed five major themes closely related to Sustainable Development Goals; Science Technology and Innovation for Sustainable Development Goals, Citizen Science, Innovation Eco-system, Emerging Technologies and Nanotechnology.

The ceremonial opening of the Forum took place on 7th September 2016 at Nelum Pokuna Mahinda Rajapaksa Theatre, with His Excellency Maithripala Sirisena, the President of the Democratic Socialist Republic of Sri Lanka as the Chief Guest. While Hon. Susil Premajayantha, Minister of Science Technology and Research welcomed the President and participants, Prof. Michael J Kelly, Prince Philip Professor of Technology of the University of Cambridge, United Kingdom delivered the keynote address. Over 1300 invitees attended the opening ceremony, amongst who were Expatriate Sri Lankan and Foreign Scientists, Foreign dignitaries, Scientists from Sri Lanka, policy makers and administrators from public and private sector institutions, industrialists, entrepreneurs and businessmen. The expatriate Sri Lankan and foreign scientists present were from United Kingdom, United States of America, Australia, New Zealand, Japan, China, Hong Kong, Singapore, Malaysia, Bangladesh, India, Korea, Norway, Germany, Thailand, Russia, Greece, Cuba and France.

The Scientific sessions of the STS Forum was inaugurated by Hon. Ranil Wickremesinghe, Prime Minister of the Democratic Socialist Republic of Sri Lanka on 08 September 2016 at Waters Edge, Battaramulla. At this occasion the keynote address was delivered by Hon. Koji Omi, former Minister of Finance of Japan and Founder Chairman, STS Forum Japan. The high light of the day was the official launching of the National Biotechnology Industry Association (NBIA) by the Prime Minister Hon. Ranil Wickremesinghe.

The inauguration was followed by three days of plenary, key note addresses and breakout/panel discussion sessions. The Plenary sessions considered key nationally important areas closely allied to Sustainable Development Goals while five themes associated with these key areas were taken up at breakout sessions run in parallel; each theme being discussed under four sub-themes.

The final day of the Forum was dedicated to proposing the 'Way Forward' for each of the areas considered during the Plenary and breakout sessions and the adoption of the 'Colombo Resolution'.

The STS Forum Sri Lanka 2016 was a land mark event in the S&T history of Sri Lanka. It was a highly successful interaction that transpired with whole hearted and overwhelming support of the Sri Lankan expatriate and local scientific community. The Ministry of Science Technology and Research and all R&D institutes of the country have a major role to play in facilitating the necessary support platforms to ensure that recommendations arising from the Forum – The Way Forward - and those highlighted in the 'Colombo Resolution' are implemented for the benefit of the society.

Key messages originating from presentations and subsequent discussions, both at Plenary sessions and five breakout groups, and the 'Colombo Resolution' are documented in this report. For details of the presentations and discussions that followed, the reader is referred to the power point presentations and video recordings posted in the COSTI website www.costi.gov.lk/sts/

Key Messages from Concurrent Sessions

1. STI for Sustainable Development Goals

- Until recently STI had received very little attention in our development plans. The first year development plan of Sri Lanka hardly makes any mention of STI. The very low investment in Sri Lanka in Research and Development is currently below 1%.
- Around 14 of the SDG's place emphasis on technology as a way of moving forward.
- It was vital to get the private sector involved in supporting the attainment of the SDG's. This had relevance in situations where there were issues in funding. However the Sri Lankan private sector was extremely conservative and rarely supported such development. This was contrasted with the United States where the private sector was very forthcoming in supporting for example University Chairs. In one instance the NDB in Sri Lanka had supported a Chair on entrepreneurship - but this was an exception.
- The session proposed that it was necessary to devise systems and policies of engaging and involving the private sector to support Sri Lanka's attainment for SDG's.
- This session recognized the vast contribution that big data could make to many of the SDG's such as health and wellbeing.
- An example was the case of a doctor with a body of an unconscious person in front of him. The doctor has no idea of the history of the patient or how he has ended up in this condition. However if the thumb print of the patient would enable him to access the vast amount of data which comprises the medical history of the unconscious person (Date of birth, allergies, medication, previous surgical operations etc.), he would be able to address the formulation of some type of diagnosis.
- Another example was used in how the volume of internet searches on specific country would enable predictions of the tourist arrival for that country in the coming months.
- As a way forward it was emphasized that it is vital that the government develop policies and legislative enactments to address issues such as privacy of data, as a pre-requisite to enabling big data to become a meaningful tool to support the development of the country.
- Although Science Diplomacy according to the Royal Society has been around for over 200 years, it is relatively a new concept in Sri Lanka.
- Science Diplomacy normally operates in three areas of policy:
  a) Science in Diplomacy - Informing foreign policy objectives with science (For example Sri Lanka's stance on climate change may be based on scientific advice on the effect that climate change was having on the country).
  b) Diplomacy for science - Improving scientific and research cooperation between countries using diplomacy and existing diplomatic channels.
  c) Science for Diplomacy – Improving relations between counties using science (For example western nations could strengthen relations with the country like Iran by cooperating on Nano-Technology).
- Science diplomacy should support and not be divorced from the interest of the common man. The common man's interest lay in such areas as how science could

enable access to cheaper and better medicines. There is a concern on the inability of science to provide a solution for issues such as CKDU. Various theories had been advanced relating to Cadmium, Glyphosate etc. but there was nothing tangible.

- The key message was to develop an innovation lead, STI focused, foresight oriented innovation eco-system with supportive governance policies. There was also emphasis that the innovation eco-system should facilitate a bottom up approach to enable commercialization of innovations and inventions coming up from universities, inventors etc.
- There should be a Forum action plan developed within three months, and that inter-ministerial committees should be set up to further the recommendations of the Forum.

2. Citizen Science

- The STI Policy of the Sri Lankan Government should promote and encourage community involvement in science and giving assistance to scientific research. This encouragement may be conveyed to all sections of the society - rich and poor, initiated and non-intiated to science.
- Several projects that involve the wider Sri Lankan citizenship with science are currently underway, and there is scope to adopt other contemporary international initiatives. To activate these intiatives in a coordinated and integrated way that would benefit Sri lanka's knowldge economy, careful examimation of the modalities need to be put in place.
- Encourgament by offering tangible incentives may be also considered.
- Also, trends, such as apathy to conventional fieldwork-based research, needs sociological exploration as well.
- Informal science education has a crucial role to play in the Sri Lankan Government's agenda of inclusiveness, sustainability and greater regional engagement that aims towards a world-class integrated innovation system in the 21st Century.
- The multiple trajectories of informal science education currently happening in Sri Lanka, and those planned for the near future, need to culminate in one of the key representations of Sri Lankan culture (alongside cricket, etc.).
- In order to achieve these goals, it is recommended that Sri Lanka needs to invest in the necessary infrastructure, in particular a world-class, interactive, Science and Technology Centre that provides an informal science education platform for supplementing formal science education at primary, secondary, tertiary and higher levels, and empowering, inclusively, the wider general public by spreading awareness about scientific issues through life-long learning opportunities.
- The traditional and new media, that include both print and electronic modes, especially television, are alreday recognised as strong platforms for science communication with both expert and non-expert audiences.
- Several challenges to effectively achieve communication in these respective spaces were discussed, with the proposition of solutions to challenges in the print media deliberated.

- It was acknowldged, however, the paradigm shift presented by new/social media has created previously unknown challenges to science communication.
- To make these platforms more effective, we need to link it with the Science and Technology centre (mentioned above) to have safe places for difficult conversations. Relevant training of science communicators to enable the objectives, was recommended.
- Additionally, the Science and Technology Centre will be a nexus for effective partnerships between schools, universities, scientists, other research institutes and the Sri Lankan Government, which will lead to the creation of a rich human resource pyramid with a wide base, that will help Sri Lanka to respond to the trilemma of the 21st Century; i.e. economic growth, environmental preservation and resources procurement.
- In order to respond to these needs, well-developed science communication must be an integral component of the Science and Technology Centre. This would mean that different stakeholder groups can actively seek out and participate in science and technology engagement opportunities that have been purposefully designed for meaningful interaction.
- Science communication in the Science and Technology Centre should be directed by public interest; i.e. through bottom-up approaches

3. Innovation Eco-system

- The Sri Lankan innovation eco system encompasses entire innovation cycle starting from ideation to research, followed by technology development, up scaling and commercialization.
- It should embrace the people and their expectations in this chain. Globally a rapid change on the needs of the industry and the innovation ecosystem is visible, as we are beyond the 4th industrial revolution. Therefore, we should be able to adapt to the changes which is very unlikely happening in Sri Lanka.
- Importance of strengthening the capacity, integrating and connecting all different actors and activities of the eco-systems to get a meaningful outcome was emphasized. Skills, infrastructure, finances etc. needs to be addressed in the ecosystem, in parallel.
- The approach emphasizes the role of various institutional structures and social forces in determining innovative capacities; its key insight lies in the emphasis placed on the systemic nature of the relationships.
- Systems are defined as a set of interrelated components which share a common boundary and work towards a common purpose. An innovation system is thus comprised of the relationships among a set of components that interact in the production, diffusion and adoption of new and commercially valuable knowledge.
- Adaptability also requires a different mind-set, therefore a changing ecosystem to have different people of new thinking. All stake holders, scientists, industrialist, government officials and policymakers should realize the changing of mind-set for innovation for investments. The university-industry-institution interaction is vital.

- It was noted that Sri Lanka does not have commercial banks willing to invest in innovation due to high risk. But we realized and noted that foreign financial organizations are willing to be a part of our innovation eco system by investing on innovation and we have to explore these opportunities in a fruitful manner.
- Intellectual property acknowledged the urgent need to rapidly change the NIPO to meet the increasing demand to facilitate shorter registration process.
- Leading universities in SL find it extremely difficult to commercialize. Actors in the ecosystem work in silos in an ad-hoc manner. We have to bring these actors together to work in harmony for better development in Sri Lanka.

4. Emerging Technologies

- The Breakout Group on Emerging Technologies discussed several of the following areas which have been identified as emerging technologies (McKinsey studies). Some of the areas were discussed in plenary sessions too. Nanotechnology was separately considered in a separate Group.
    - Mobile Internet
    - Nextgen genomics
    - Automation of knowledge work
    - Internet of Things - IoT
    - Advanced Robotics
    - Advanced materials
    - 3 D Printing
    - Energy Storage
    - Autonomous and near autonomous vehicles
    - Cloud Technology
    - Advanced O&G exploration and recovery
    - CERA discussion – Centre of Excellence for Robotics Applications
    - NBIA – launch and Kick-off meeting
- In these areas there is the need for government support and it was argued that this is understood. It is not immediately possible for a private sector company to undertake a project with all the associated risks. GOSL has shown the possibility via SLINTEC and this could be repeated. There is also the need to understand the possibilities with collaboration across. Today BT, NT and ICT provide the synergy via triple convergence. Government must understand the synergy and the value possible.
- Some areas for development are
    - ICT
    - Need to understand the importance of data science
    - Enhancing the utilization of image processing technologies
    - ICT developments for social benefit
    - Mobile Broadcasting – ie for disaster management
    - Electronics and robotics
    - Rs 5 bn investment plan – can SLEMEA too come into the CCC fold in a similar manner to BIS.

  - Robotics and soft robotics leveraging on successes of the textile industry
  - Biotechnology
  - National Biotechnology Industry Association (NBIA)
  - Biotechnology Innovation Park
  - Research and Manufacturing nexus (genomics, biopharma, immunotherapy, vaccines
  - Triple hexagon to realize triple convergence
  - Pioneering status for nascent manufacturing industries
  - Space technologies:
    - National Hub for Receiving and Redistribution of Earth Observation Data
    - Nano-satellite Program
    - Domain Specific Collaborative Research on Space Technology Applications
  - Human Capital Development
- Cabinet to be informed on the possibility with emerging societies.
- There are significant opportunities if one considers indigenous knowledge with emerging scientific advances. Genomics tandem with Ayurveda can possibly unlock many mysteries. Sri Lanka must bring Ayurveda into global prominence by this multi-disciplinary approach. It must also safeguard indigenous knowledge and traditional rights while elevating the status of these knowledge systems.
- There are significant benefits possible by deploying emerging biotechnologies in Sri Lanka.
- Today Sri Lanka leads the world in supporting in wearable applications connected to textiles.
- There is significant potential in moving on to areas such as flexible soft robotics where one may be able to say good bye to wheel chairs.
- Electronics design architecture, artificial intelligence along with data analytics can open up significant opportunities.
- Ground based remote sensing and related technologies and achieving air-borne geophysical surveillance, nano satellite capabilities etc. can propel nation's ability to advance as well as readiness in disaster situations.

5. Nanotechnology

- A 20 year old subject with at least another 30 years to go
- Until 2012, through its National Nanotechnology initiative, the USA has invested $ 3.7 billion the European Union has invested $ 1.2billion and Japan $ 750 million
- For example, across all sectors globally from 2012 to 2014, sales of Nano intermediates grew from $167 billion to $453 billion, while sales of nano-enabled products grew from $848 billion to $ 1.6 trillion.
- However, the market for nanomaterials themselves was less robust. Sales grew from $1.6 billion to $2.1 billion over the same period.
- Most materials and living matter are designed from the nanometer scale upwards

- Implications and applications in all sectors of the economy
- Structure property relations: some materials owe their specific functionality to nanometer scale features, e.g. the colours of butterfly wings, fish scales
- Some products owe their place in the market because of nanometer scale properties
- Current landscape: SLINTEC, university groups, research institutes
- Approximately 200 professionals..
- Specific local topics and opportunities:
    - Nano- engineering and opportunities
    - Materials for energy including solar
    - Water purification
    - Smart Textiles
    - Nature medicine
    - Structural composite
- Specific New Opportunities
- Space elevator (?!)
- More of the same with increased emphasis on:
    - Metrology to be able be to understand the structure- property relations
    - Improving the control of structure for manufacture
    - Nano-engineering for manufacture at large scale
    - Targeting unsolved societal needs where nanotechnology might provide a solution- energy, food, water, medicine etc.
    - Established toxicology

THE COLOMBO RESOLUTION ON SCIENCE TECHNOLOGY AND INNOVATION (STI) FOR SUSTAINABLE NATIONAL DEVELOPMENT (SDG)

STS Forum 2016

1. We, the participants of the Science and Technology for Society Forum Sri Lanka 2016, recognizing the holistic approach adopted in the formulation of the UN's Sustainable Development Goals (SDGs) and that the importance of innovation is highlighted in goal number 9 of the SDGs, agree that STI whether it be scientific or social innovation is a key driver of sustainable national development.
2. We believe that economic development should go hand in hand with social and environmental progress. Hence we appreciate the key role that STI plays in the improvement of industrial processes, industrial output and driving industrial and economic growth, while at the same time recognizing that STI plays an important role in ensuring that industrial processes and output conforms to protecting and managing our environment in a sustainable manner.
3. We recognize that new emerging technologies such as bio-technology, renewable energy, data science, robotics, space technology and nano-technology may be harnessed for economic progress and poverty alleviation.
4. We see STI and social innovation as being linked and complementary and may work hand in hand to support socially related SDGs such as quality education, gender equality, reducing inequalities and peace, justice and strong institutions.
5. We recognize that STI may play a significant role to assist the attainment of SDGs including those related to zero hunger, good health and well-being, clean water and sanitation, affordable and clean energy and sustainable cities and communities.
6. We note that in addition to the support provided by STI to enable cleaner processes that mitigate environmental degradation in the context of the SDGs related to climate action, life below water and life on land; new technologies relating to space and satellite communication as well as remote sensing will also assist the attainment of these goals.
7. We are concerned that there may be a current mismatch between development priorities as stated in national development plans and budgets, and the role of STI and STI practitioners in the development process. We see an urgent need for requisite alignment by developing and sustaining the human capital required to incorporate STI in sustainable national development.
8. With the above in mind, we therefore call upon all policy makers, scientific practitioners and legislators to foster STI through a supportive innovation-led eco-system that includes advocacy, appropriate policies, adequate resourcing, international partnerships and investing in people and institutional capacities in order to facilitate and achieve sustainable national development.

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