Status of Nano-Technology

Sri Lanka

Iresha R.M. Kottegoda

Industrial Technology Institute
Profile

Geography

- **Area**: 65,610 sq. km. (25,332 sq. mi.); **Cities**:
  - **Capital**: Colombo (pop. est. 1.3 million--urban area). Sri Jayewardenepura-Kotte is the officially designated capital and is the site of Parliament. **Other cities**--Kandy, Galle, Jaffna.
  - **Terrain**: Coastal plains in the northern third of country; hills and mountains in south-central Sri Lanka rise to more than 2,133 meters (7,000 ft.).
  - **Climate**: Tropical. Rainy seasons--light in northeast, heavy in southwest

People

- **Nationality**: Sri Lankan(s).
- **Population**: 21.3 million.
- **Ethnic groups (2002)**: Sinhalese (74%), Tamils (18%), Muslims (7%), others (1%).
- **Religions**: Buddhism, Hinduism, Islam, and Christianity.
- **Languages**: Sinhala and Tamil (official), English.
- **Education**: Literacy--91%.
Government
- **Type:** Republic.
  
  **Independence:** February 4, 1948

Economy 2010
- **GDP:** $49.55 billion.  
  **Annual growth rate:** 8%.  
  **Per capita income:** $2200

  **Natural resources:** Limestone, graphite, mineral sands, Montmorillonite, gems, and phosphate.

  **Agriculture (11% of GDP):** Major products—rice, tea, rubber, coconut, and spices.

  **Services (59% of GDP):** Major types—tourism, wholesale and retail trade, transport, telecom, financial services.

  **Industry (29% of GDP):** Major types—garments and leather goods, rubber products, food processing, chemicals, refined petroleum, gems and jewelry, non-metallic mineral-based products, and construction.

  **Trade: Exports**—$8.3 billion: garments, tea, rubber products, jewelry and gems, refined petroleum, and coconuts.  
  **Major markets**—U.S. ($1.77 billion), U.K., India.

  **Imports**—$13.5 billion.  
  **Major suppliers**—India, Singapore, Hong Kong, China, Iran, Malaysia, Japan, U.K., U.A.E., Belgium, Indonesia, South Korea, U.S. ($178 million).
### Hi-tech Market

<table>
<thead>
<tr>
<th>Product</th>
<th>Year</th>
<th>Global Market Billion US $</th>
<th>Sri Lankan export earnings Billion US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>2005</td>
<td>1,200</td>
<td>0.4 (0.03% of the global market)</td>
</tr>
<tr>
<td>IT</td>
<td>2006</td>
<td>1,073</td>
<td>0.07 (0.007% of the global market)</td>
</tr>
<tr>
<td>Telecom</td>
<td>2006</td>
<td>1,662</td>
<td></td>
</tr>
<tr>
<td>Biotech products</td>
<td>2007</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Nano products</td>
<td>2007</td>
<td>147*</td>
<td></td>
</tr>
</tbody>
</table>
Technical Revolution

- South Korea and Taiwan caught the Electronics and ICT Revolutions in the 1960 – 1980 periods.

- China, India and Cuba have caught the Biotechnology Revolution.

- Our per capita GDP was US$ 320 as against US $ 84 for South Korea in the 1960s, in 2009 our per capita GDP had gone up to US$ 2200, whereas South Korea exceeded US $ 20,000 (being nearer US $ 30,000).

- South Korea invested 3.2% of its GDP for S&T and R&D while Sri Lanka only invested 0.13% of GDP.

- Sri Lanka had only 1.5% of high technology exports while Korea had 75%, Thailand had 27%, Singapore and Malaysia exceeded 50%.

- High Technology products lead to much higher profits
4520 R&D scientists in Sri Lanka in 2006-scattered in 31 research institutes 16 universities under 10 ministries

SL invested 0.17% of GDP on R&D (Government contribution was 0.11%)

The expenditure on war in the past 30 years adversely affected the budget allocation for R&D

Neglect of R&D commercialization practices in SL

Foreign contributions to R&D in SL has dropped
Status of Nano-Technology R&D

- Training of R&D Personnel - Very low output of postgraduate research degrees by the Sri Lankan universities (70 per year)

- Brain drain - There is significant brain drain due to low salaries and a lack of a conducive environment for R&D for S&T personnel

- Need to increase research job opportunities – Establish a ‘full-time’ researcher cadre in the Universities and increase the cadre for R&D personnel in R&D institutions
Ministry of Technology and Research

Vision

- Sri Lanka becomes a scientifically and technologically advanced country by the year 2020.

Mission

- To formulate and implement policies pertaining to the popularization and advancement of science and technology, including scientific research and development and transfer of technologies, to ensure improved quality and productivity so as to upgrade economic activities, which are essential for the economic and social development of Sri Lanka.
Policies, Strategies and Plans

• National S&T Policy
• National Bio Technology Policy
• Science Technology and Innovation Strategy
• Science Technology and Innovation Plan
• National nanotechnology policy and strategy
• National R&D and Innovation Policy
• National University-Industry partnership policy
• National policy for science education
• Science for All policy

SCIENCE, TECHNOLOGY & INNOVATION: KEY TO WINNING THE ECONOMIC WAR.

Prof. Tissa Vitarana
Minister of Technology and Research (Former)

Hon.(Mrs) Pavithra Wanniarachchi
Minister of Technology and Research
Science, Technology & Innovation Strategy for Sri Lanka

Increase the high tech value added exports from 1.5% to 10% by year 2015 through the Advanced Technology Initiative.
Policy implications and governance of nanotechnology
R&D and innovation


Goals

1. An efficient system to actively harness innovations and technologies to generate and improve products and services to contribute towards doubling the per capita GDP in an equitable manner by increasing the high tech value added exports and the production for the domestic market.

2. Well established, dynamic and resourced world class National Research and Innovation Eco-System.

3. An effective framework to prepare the people of Sri Lanka for a knowledge society

4. Sustainability principles entrenched in all spheres of scientific activities

Goals 1

● 1.1. Increase the high tech value added exports from 1.5% to 10% by year 2015 through the Advanced Technology Initiative.

● 1.2. Achieve a marked increase of import replacement by strategic production and social activities in a competitive milieu through enhanced and focused research and development.

● 1.3. Develop a dynamic technology transfer platform for wealth creation through the Techno entrepreneurship Initiative.
Strategies proposed in the S&T Governance of the National Research and Innovation Eco-system

This would provide a system and operational instruments to coordinate research institutes scattered throughout the country under different Ministries within a unified framework for:

- Funding, coordinating and monitoring operational mechanisms.
- Managing the National Research Cadre and the HR Development through the Governance platform.
- Implementation of the R&D Infrastructure Development Initiative.
- Ensuring Technology Transfer and promoting Techno-entrepreneurship.
- Ensuring S&T input into national development planning.
National Centres of Excellence are established:

Establish mechanisms to transform Sri Lanka into a high-tech knowledge hub in technologies for mega projects by acquiring capacity to replicate these projects locally (Eg. Process Engineering, Computer modeling, ICT, Ports, Hydropower, Highways & Bridges, Hotel Management, Plantation management etc.,)

Ensure that only sustainable advanced technologies (high technological content, environmentally sound technologies etc.,) are permitted into the country when importing technology, including for infrastructure projects such as ports, power plants, highways, bridges etc., and systems should be established.

Give priority to exchange of personnel in high tech areas

Establish schemes to assist local entrepreneurs to forge technical collaborations with foreign hi-tech industries in transferring advanced technology

Expand and strengthen programmes intended to carry high-end technology to non-metropolitan areas and to small and medium enterprises

Identify opportunities and offer assistance to industrialists to adopt, adapt and assimilate technologies (especially high-end technologies) in Sri Lanka

Infusion of nanotechnology, mechatronics and biotechnology, ICT, and satellite technology in all above endeavors should be given high priority by affording incentives and other inducements for the private sector to invest and promote public-private partnerships. 

Increase our market share by improving competitiveness, productivity, quality and social & environmental acceptability especially in the export sector
Nano-Technology Initiatives-Sri Lanka

Establishment

- Nanotechnology committee by NSF &
- Mirror committee on Nanotechnology by SLSI
- SLINTEC, Ministry established in partnership with the private sector

Budgetary Provision 2011

- 200 % deduction of expenditure incurred to enterprises on undertaking R&D, registration of patent, trademarks and designs, automation through technology and training of their work force.
- Increase our national R&D expenditure by both the public and private sectors to at least 2 percent of GDP
- The Innovation & Technology Development Fund for R&D Rs1, 000Mn.
- Customs duty to be removed on instruments and apparatus for scientific research
- A monthly research allowance equivalent to 25 percent of the basic salary to be paid to university academic staff and staff grade officers of research institutions
Nano-Technology Initiatives-Sri Lanka

Budgetary Provision 2012 - Furtherance of Research and Development (R&D)

- Income tax on research income reduced to 16 per cent from the previous 24 per cent
- Research Institutes exempted from VAT
- Income tax on research institutes reduced to 20 per cent
- A triple reduction on R&D to private sector that obtains services through Government Research Institutions
- Nominal fee for R&D services rendered to SMEs
- 50 per cent of income from R&D services to private sector to be given as a promotional income
- Allocation of Rs.300Mn to the National Research Council to encourage special research activities.
Nano-Technology Initiatives-Sri Lanka

- Universities
- Institutes – Ministry of Technology and Research
  - Arthur C. Clarke Institute for Modern Technology (ACCIMT)
  - Industrial Technology Institute (ITI)
  - Institute of Fundamental Studies (IFS)
  - National Engineering Research and Development Centre (NERD)
  - National Research Council (NRC)
  - National Science and Technology Commission (NASTEC)
  - National Science Foundation (NSF)
  - Sri Lanka Accreditation Board for Conformity Assessment (SLAB)
  - Sri Lanka Standard Institute (SLSI)
Nano-Technology Initiatives-Sri Lanka

Nano-Technology based value added products -Sri Lanka

- Development of self-cleaning ceramic tiles for swimming pools-value addition to local ceramic industry
- Synthesis of graphite oxide and graphene from natural graphite add 100,000 times to the value of raw material.
- Producing Titanium Dioxide would add 250 times to the value of raw Ilmenite. While we gain US $ 8 million each year by exporting Ilmenite we spent US $ 12 million to import Titanium Dioxide for our paint industry.
- Development into the application of Nano-Enhanced rubber products
- Integrating Nanotechnology into clothing materials
- Nanotechnology for agricultural applications
- synthesis & functionalization of carbon Nanotubes and other commercially important Nanomaterials.
- Synthesis and application of nano-composites
- Solar cells: Solid state dye sensitized solar cells (Prof. K. Tennakone)
- Solar energy for decontamination of water
- Cement and Concrete industry
Nano-Technology Initiatives-Sri Lanka
Self-cleaning Tiles
Potential Areas of Nanotechnology application

- Synthesis and application of nano-composites in energy storage devices, vehicle parts, water filtration systems, noise absorbance, fire retardant, high voltage electrical applications
- Solar cells: Solid state dye sensitized solar cells (Prof. K. Tennakone)
- Solar energy for decontamination of water
- Value addition to natural resources
Potential areas of cross-country R&D cooperation and collaboration

- Synthesis and application of nano-composites in energy storage devices, vehicle parts, water filtration systems, noise absorbance, fire retardant, high voltage electrical applications
- Solar cells: Solid state dye sensitized solar cells (Prof. K. Tennakone)
- Solar energy for decontamination of water
- Synthesis of advanced materials (Si, Graphene, SiN,SiC) from natural resources
- Applications in Ayurvedic (indigenous medicine)
- Food technology
- Herbal technology
- Value addition to mineral resources
Acknowledgement

(Eng) Mr. D.R. Pullaperuma-NERD chairman
Dr. A. M. Mubarak-ceo-ITI
Mr. J.T.S. Motha-Acting head Materials Technology Section
Mr. C.H. Manoratne
Materials Technology Staff
Dr. Satyabrata Sahu- In-Charge of Technology Monitoring and Assessment (APCTT)
Mr. K. Ramanathan –Head, APCTT of the United Nations – ESCAP
All the assistance from Thailand

Thank you