

# TECHNOLOGY TRANSFER: “CHALLENGES, OPPORTUNITIES AND SUCCESSFUL CASES”



Sri Lanka

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## SRI LANKA

Area - 65,600 Sq.Km.

Population - 20 Mn.

DGP per Capita 2010 - US\$ 2,200  
(2006 - US\$ 1,355)

World Bank Classifies Sri Lanka now  
as a lower middle income country



## STATUS CORE OF R&D & INNOVATION IN SRI LANKA

- 4520 R&D Scientists in Sri Lanka  
(Critical mass 18000) UNESCO-2004 World avg. 894 /Mn. Inhabitants
- R&D personnel scattered in 31 Research Institutes and 16 Universities
- Investment on R&D 0.17% GDP  
(Govt.- 0.11%, Priv. Sec.- 0.06%)
- R&D funds adversely affected due to War  
Demoralized Researchers, Brain Drain

## STATUS CORE OF R&D & INNOVATION IN SRI LANKA

- **Neglect of R&D commercialization practices in Sri Lanka have severely affected the wealth creating capacity in R&D.**
- **Foreign Contribution to R&D has dropped significantly**  
(1996 -22.6% to 2006 - 4.8%)  
(As such no engagement on cutting edge technology)

## CHALLENGES & OPPORTUNITIES :-

30 years of Terrorist Activities have come to an end

### SCIENCE, TECHNOLOGY & INNOVATION

KEY TO **WINNING** THE  
ECONOMIC WAR

### SCIENCE, TECHNOLOGY & INNOVATION STRATEGY FOR SRI LANKA 2011-2015

- ▶ NASTEC gets policy document for S&T approved by the Cabinet in 2009
- ▶ Cabinet of Ministers approves the SCIENCE, TECHNOLOGY & INNOVATION STRATEGY FOR SRI LANKA 2011-2015
- Vision

*Sri Lanka to be a leader in knowledge creation and innovation in Asia whilst rapidly harnessing that knowledge for the prosperity of our people*

## SCIENCE, TECHNOLOGY & INNOVATION STRATEGY GOALS

- 1. Contribute towards doubling the per capita GDP and increasing the high tech value added exports from 1.5% to 10% by 2015.**
- 2. Well established dynamic 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.**

## R&D INSTITUTIONS IN SRI LANKA

Sector	Research Institutions /University Faculty
Agriculture	Farm Mechanization Research Centre Institution of Post Harvest Technology Rubber Research Institute Tea Research Institute Coconut Research Institute Agriculture Faculties of Universities
Marine and Aquatic Resources	NARA
Industrial and Engineering	Industrial Technology Institute National Engineering Research and Development Centre of Sri Lanka Arthur C Clarke Institute for Modern Technologies

## R&D INSTITUTIONS Contd.....

Sector	Research Institutions /University Faculty
Fundamental Studies	Institute of Fundamental Studies
S&T Policy /Funding	National Science Foundation National Science & Technology Commission Council for Agriculture Research Planning

### **SUCCESSFUL CASES at**

- **Industrial Technology Institute**
- **National Engineering Research and Development Centre of Sri Lanka**
- **Arthur C Clarke Institute for Modern Technologies**

## ITI- Technology transferred

- **KOTHALAHIMBUTU BISCUIT**-(An Aurvedic herbal plant based) transfered to a Biscuits Manufacturer.
- **MASSAK NP** - An insecticide formulation based on natural product to combat mealy bug and other insects was successfully transferred to an entrepreneur.
- **BTi for mosquito control** - BTi formulation was transferred to a Company for manufacturing
- **'Lime Blast' Sports Drink** - A caffeine free sports drink using natural lime was transferred to a company to commercialize.

## ITI - Technology transferred

- **Tuna minced fish balls curry** -  
Award winning ready to serve product transferred to industry.
- **Wood Preservative from Cashew Nut Shell Liquid (CNSL)** -  
A preservative which protects timber from termite and fungal attack was developed and transferred to Cashew Corporation

## ITI– Technology transferred

- **Polyester Garment Waste as Boiler Fuel**

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Solid fuel briquettes from polyester garment waste with little adverse environmental effects were developed and transferred to the garment industry.

- **Modified coir pith for oil absorption –**

A product found acceptable for export to Japan is being produced by a leading coconut processor

## ITI - Technology transferred

- **Mosquito repellent cream** – The cream based on local plant products is now sold locally and exported by a company.
- **Kithul Products** - The ITI KASPER treatment method to enhance sap yield by 300% was transferred to thousands of kithul tappers.

## ITI–Technology from overseas

- **Bamboo shoot production and processing** – Technology transferred from International Centre on Bamboo and Rattan, China (ICBR) has been successfully used to develop an edible bamboo shoot industry in Sri Lanka with the support of the Common Fund for Commodities (CFC).
- **Low cost animal feed from fish waste** - The processing technology for converting fish waste into protein-rich low-cost feed ingredients (silage) for use in animal and aqua feed was developed with Norwegian funding and transferred to the Ceylon Fisheries Harbours Corporation with a commercial production unit in Beruwela.
- **Coir processing** – A US \$ 740,000 project funded by the Common Fund for Commodities (CFC) on improving outdated technology used in the coir processing industry resulted in the setting up of a Test mill at Dunkannawa and improved methods for the production of coconut coir.

## National Engineering Research and Development Centre (NERD Centre)

### SUCCESSFUL CASES

1. **Bio mass rice cooker**
2. **Natural Draft Wood gas stove**
3. **Industrial stove**
4. **Virgin coconut oil extractor (HH & Industry )**
5. **Motorized m/c for extracting palmyrah juice**
6. **Cost Effective Housing Technology**
  - Compressed Earth Block
  - Slip form wall
7. **LP Gas Crematoria**



## NERDC - SUCCESSFUL CASES

### Biomass product for the Household – 2 important Items

#### 1. Bio mass rice cooker



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#### Main features

- ❑ Can cook 01 kg rice using the 2 shells of 01 coconut.
- ❑ Cooking time - 40 min.
- ❑ No over cooking or burning at the bottom
- ❑ No blackening of the rice pan
- ❑ Can keep rice warm for 07 hours
- ❑ Can boil 2.5 -3 liters of water
- ❑ Can make 100 nos. of string hoppers.
- ❑ Solves environmental problem due to throwing of coconut shells to the surrounding.

Existing Licensees - 6 No Marketed  
- 1284 No.

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## NERDC - SUCCESSFUL CASES

### 2. Natural Draft Wood gas stove



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### Main features

- ❑ Operation type - batch
- ❑ Operating time - 50 - 60 min.
- ❑ Capacity - 600g
- ❑ Can cook - 01 kg rice  
or 03 curries  
in one batch

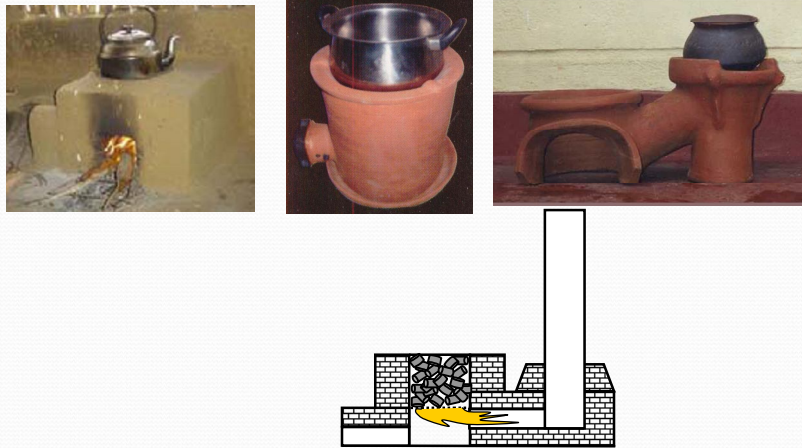
Existing Licensees - 3 Nos

Nos. Marketed - 12400

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## PREVIOUSLY DEVELOPED STOVES FOR EFFICIENT USE OF BIOMASS FOR HOUSEHOLD

- **Biomass**
  - Technologies: Direct Combustion



## Biomass Product for the Industry

### Recently Developed

### 3. Industrial stove



## Features

- Fuel : Fire wood
- Capacity : 20 litre
- Fire wood consumption rate : 04 kg/hr
- No ash added to food
- Portable
- NO heat and smoke exposure to the operator
- Heat controllable

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## Applications

### *Large scale cooking*

- Hotels
- Canteens
- Refugee Camps
- Army Camps, etc.

### *Small & Medium Scale Industries*

- Milk industry
- Kithul industry
- Confectionary industry
- Ayurvedic industry

**Existing Licensees 3 Nos**

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## NERDC - SUCCESSFUL CASES

### 4. Virgin coconut oil extractor (HH & Industry )



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## NERDC - SUCCESSFUL CASES

### 5. PALMYRAH JUICE EXTRACTOR

- Extracting palmyrah juice and pulp by hand very difficult.
- But it's a Delicacy
- Cottage Industry in North, North West and East
- Post Harvest support
- Motorized m/c for extracting palmyrah juice and pulp



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## NERDC - SUCCESSFUL CASES

### 6. Cost Effective Housing Technology

- ▶ Cost effectiveness in areas
    - Plinth beam as against rubble foundation
    - Pre-stressed concrete columns
    - Slip form wall
    - Cement soil block wall
    - Pre-stressed concrete door and window frames
    - 2" thick composite concrete floor slab
    - Pre-stressed concrete trusses & purling for roof
- Existing Licensees 40 Nos**

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## Cost Effective Housing Technology..... COMPRESSED EARTH BLOCK

### SUCCESSFUL CASES

- Solution for sand crisis
  - Environmentally friendly products
  - Freely available, so, less transport problems
  - Comfortable environment in house ( low heat in house)
  - Simple technology and simple machines
  - 15%-50% cost can be saved
  - Creating new employment
- Existing Licensees 2 Nos**



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## NERDC - SUCCESSFUL CASES

### 7. LP Gas Technology for Crematoria

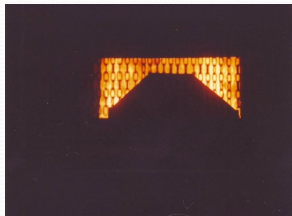
- Improvement of the crematorium (1996 -1997)
- Construction of crematoriums while incorporating improvements
- Preparation of drawings and BOQ
- Technology transferring (1998 -1999)

**Existing Licensees 3 Nos**  
**Nos. Constructed - 53**

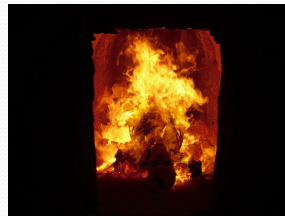
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## BASIC STAGES OF CREMATION

No	Phase	Duration (min)	Process
1	Charging	-	-
2	Ignition	15	Combustion of casket starts
3	Full combustion	30	Combustion of body & casket
4	Final combustion	45	Combustion of the body



Ignition



Full combustion



Final combustion

## Arthur C Clarke for Modern Technologies

### SUCCESSFUL CASES

- True RMS Voltage Recorder –  
Developed & transferred to Distribution divisions of  
the Power Utility (high Perf.)**
- PC based Oscilloscope- 500 No. given to schools.  
-5 No. licensees**
- Basic play and learn interaction audio-visual learning  
aid for visually handicapped.**

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## Arthur C Clarke for Modern Technologies

### SUCCESSFUL CASES

- Railway locomotives where manufacturers support has  
ended**
- Reverse engineered**
- recovered 2 No. locomotives**
- 3 No. locomotives about to breakdown has been  
repaired.**
- 5 No. Power coaches too have been recovered.**

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## Another success story - PUBLIC PRIVATE PARTNERSHIP

SLINTEC a private company for Nano-Technology developments – established in 2008 as a PPP with 50% Govt. equity (despite war expenditure)

Autonomy and flexibility

Laboratory complex established from scratch in 8 months

Conducive environment for R&D

## Another success story - PUBLIC PRIVATE PARTNERSHIP

- Good laboratory and IP practices
- Time bound R&D with a strong industry/ business focus
- Regular monitoring of R&D
- Local scientists responded to challenge - mindset + facilities
- 5 US patents filed within 9 months of lab operation  
(Sri Lankan average 1-2 US patents per yr)

## RE IN POWER SECTOR IN SRI LANKA

### SUCCESSFUL CASES

- **FEEDING TARIFF FOR GRID ELECTRICITY**
  - For Non-conventional renewable energy sources:
    - ✓ Small hydro, wind, biomass – Wood, Residues, MSW, Other
  - Two options:
    - ✓ Three-tier tariff: Year 1-8, Year 9-15 and Year 16+
    - ✓ Flat tariff for 20 years
  - Flat tariff:

Technology	All inclusive rate (LKR/kWh) for years 1-20
Mini-hydro	13.04
Mini-hydro - Local	13.32
Wind	19.43
Wind - Local	19.97
Biomass (Dendro)	20.70
Biomass (Agricultural & Industrial Waste)	14.53
Municipal Waste	22.02
Waste Heat Recovery	6.64

## RE IN POWER SECTOR IN SRI LANKA

### • Non-Conventional Renewable Energy

- **The Progress:**
  - ✓ 225.5 MW, 7% Grid-electricity generation

Technology/ Status	Biomass		Hydro		Wind		Solar		Total	
	No.	MW	No.	MW	No.	MW	No.	MW	No.	MW
Commissioned	2	11	87	183	4	30.15	4	1.38	97	225.5
Energy Permit	15	73	104	206	10	99	-	-	133	379
Provisional Approvals	13	160	90	113	2	20	2	20	107	313



# LANKA

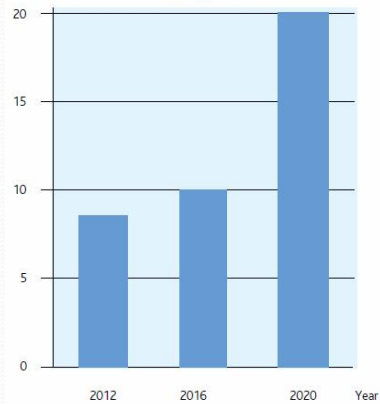
## • Non-Conventional Renewable Energy

### ▪ The Targets:

✓ 10% by 2016 and 20% by 2020

Category	2005	2010	2012	2016	2020
Electrification Coverage(%)	75	88	100	100	100
Base Demand(MW)	1768	2517	2921	3943	5306
Installed Capacity(MW)	2409	2891	3470	4732	6367
System Losses(%)	16.7	14.5	14	13	12

The Share of Renewable Energy on Grid



Year	Installed Capacity (MW)				
	Biomass	Hydro	Wind	Solar	Total
2016	40	355	230	5	630
2020 (?)	100	400	500	100	1100

## CHALLENGES IN IMPLEMENTING SCIENCE, TECHNOLOGY & INNOVATION STRATEGY

- ▶ Convincing the stake holders to firmly support the implementation
- ▶ Most importantly to set off adequate funds from the national budget
- ▶ To prioritize the action plans based on funds to be allocated
- ▶ To focus the research training to advanced technologies
- ▶ Initially to focus on training of 725 personnel over the next 5 yrs.

## CHALLENGES IN IMPLEMENTING SCIENCE, TECHNOLOGY & INNOVATION STRATEGY

- ▶ Very low output of Postgraduate research degrees by the Sri Lankan Univ. ( <100/yr)
- ▶ Very low Univ. academics engaged in R&D(5-20 %)
- ▶ Mere 21% R&D personnel in the engineering disciplines affecting the capacity for technological development

## RESEARCHERS PER MILLION INHABITANTS

<b>World average</b>	<b>894.1</b>
<b>Average for developed countries</b>	<b>3272.7</b>
<b>Average for developing Countries</b>	<b>374.3</b>
<b>Sri Lanka at present</b>	<b>237.3</b>

## CHALLENGES IN IMPLEMENTING SCIENCE, TECHNOLOGY & INNOVATION STRATEGY

- Need to Increase Research job opportunities  
(Establish 'Full time' Researcher Cadre)
- Significant brain drain due to low remuneration and lack of a conducive environment for R&D for S&T personnel
- Establish a scheme to obtain services of Sri Lankan expatriates and foreign scientists

## CHALLENGES IN IMPLEMENTING SCIENCE, TECHNOLOGY & INNOVATION STRATEGY

- Line Ministries, R&D Functions to be coordinated
- HR Developments to be streamlined and to focus research training on specified advanced technologies even though Researchers are in other line ministries

Thank You

SOME ENVIRONMENTAL ISSUES AROUSED FROM NERDC LPG CREMATORIUM

Location of crematorium	Status	Nature of protest	Actions taken
Batheegama P/S	Crematorium building was under construction	On possible environmental consequences	Forwarded a report after inspecting the site (by Ajith Jayassoriya)
Nattandiya P/S	Crematorium was in operation	On nuisances created by flue gasses	Recommended increasing of stack by 12ft.
Kurunegala P/S at Wanduragala	Building had been constructed	On possible environmental consequences  Court issued an order to suspend construction.  CEA had produced a report to court.	We forwarded a report explaining the technology of the crematorium and measures included to minimize environmental pollution.  And recommended to increase the volume of cremation chamber by

## Some other Developments at NERDC

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- Industry string hopper making machine
- Vegetable Slicer (Manioc)
- Items developed for pepper harvesting
- Development of Flap Gate for irrigational purposes