

# Cleantech in the Region

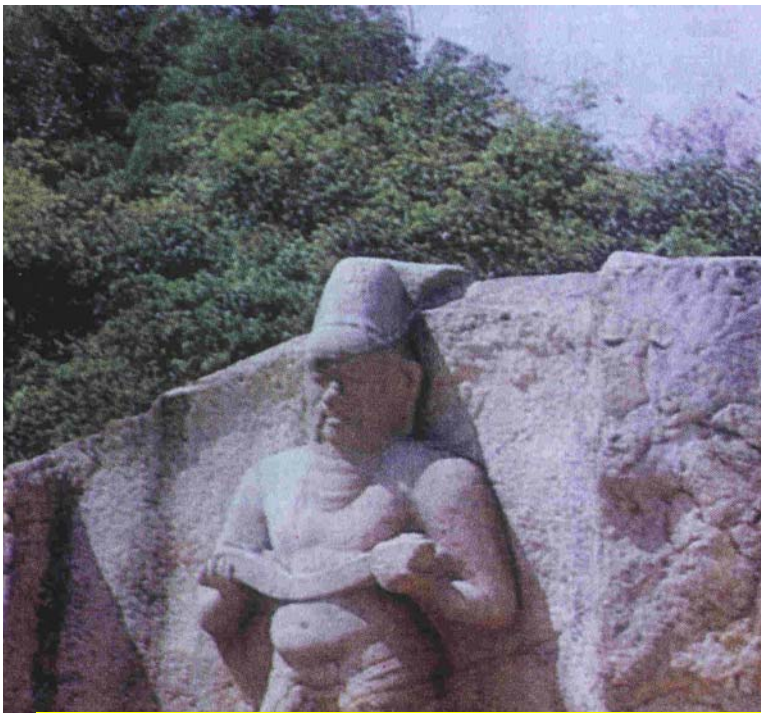
Ajith de Alwis  
University of Moratuwa

## Cleantech - Definition

*A diverse range of products, services, processes, all intended to:*

*Provide superior performance at lower costs, while  
Greatly reducing or eliminating negative ecological impact, and  
Improving the productive and responsible use of natural resources”*






**“Not a single drop of rainwater should be allowed to escape into the sea without being utilised for Human benefit.. (King Parakramabahu 1153-86AD)**

# Taxonomy of CleanTech ...


- Wind
- Solar
- Renewable fuels
- Marine
- Biomass
- Geothermal
- Waste-to-energy
- Emerging
- Measurement & analysis

**Renewable energy generation**




- Batteries
- Fuel cells
- Thermal storage
- Flywheels
- Compressed air
- Super/ultracapacitors
- Hydrogen storage

**Energy storage**




- Smart grid
- Green building
- Cogeneration
- Electronics & appliances
- Semiconductors

**Energy efficiency**



- Vehicles
- Traffic management
- Fueling/charging infrastructure

**Transportation**



- Carbon sequestration
- Carbon trading/offsets
- Emissions control
- Bioremediation
- Recycling & waste
- Monitoring & compliance

**Air & environment**



- Advanced packaging
- Design innovation
- Materials innovation
- Equipment innovation
- Production
- Monitoring & compliance

**Clean industry**




- Generation
- Treatment
- Transmission
- Efficiency
- Monitoring & compliance

**Water**



- Crop treatment
- Land management
- Aquaculture

**Agriculture**





# 7 billion in 2011

## 5 billion in 1987

### 4 billion in 1975

#### 3 billion in 1960

#### 2 billion in 1930

#### 1 billion in 1800

5 million

250 million in 1

10 000 bef. JC

5 000 bef. JC

0

1000

2009

**The world population is increasing**

## World's No 1 Environmental Problem

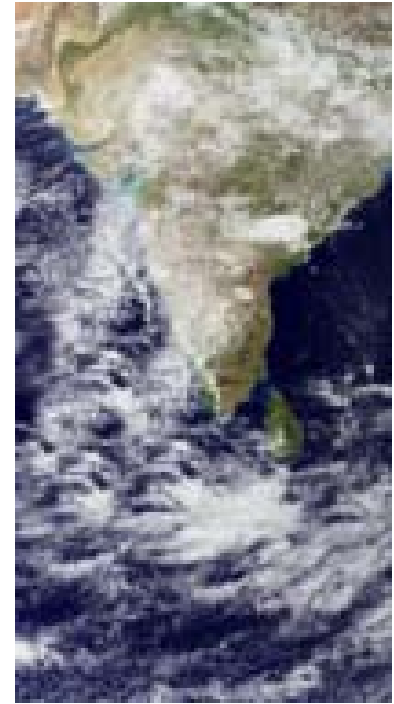
### POVERTY .....





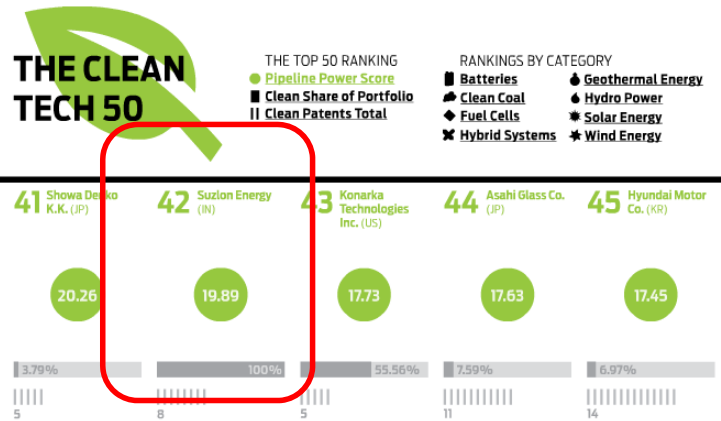
# Renewable Energy Generation

- Wind
- **Solar**
- Renewable Fuels
- **Marine** (Tidal, Wave and OTEC)
- Biomass
- **Geothermal**
- Waste-to-Energy
- **Biogas**



# Renewable Energy Generation

Go back to "The Clean Tech 50"



## Micro and Mini Hydro



- 1980 - ITDG came into the scene (UK, Nepal)
- 1989 – ITDG came to Colombo
- 1991 – Village level micro hydro programme
- 1996 – Set up Energy Forum
- 2001 – Energy Globe



**Micro Hydro – Sri Lankan Success Story  
Energy Globe 2001 (Practical Action / ITDG)**





# Pakistan



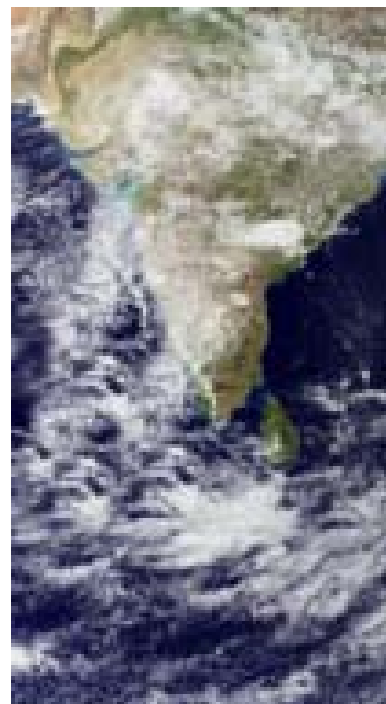
“The nation that leads the clean energy economy will be the nation that leads the global economy”



2010 State of the Union Address  
President Barack Obama

## Energy Storage

- Batteries
- **Fuel Cells**
- Thermal Storage
- **Flywheels**
- Compressed Air
- **Super / ultra capacitors**
- Hydrogen Storage







# Supercapacitors Energy Storage Fuel Cells



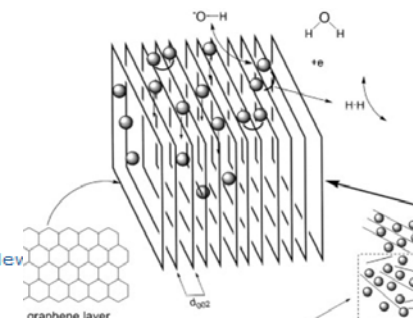
## Super capacitors launched

TNN Feb 26, 2012, 02:14AM IST

**Tags:** solar energy | Northeastern University | Nanosolar | Ministry of New  
IIT Mumbai. | capacitors launched | Andreas Hinsch Fraunhofer

KOCHI: India's first integrated solar storage tile, 'Amrita Smart', with super capacitors instead of batteries was launched here on Friday.

Developed and designed by Dr Shanti Nair, director, Amrita Centre for Nanosciences, and his team of researchers, the product can be used to power mobile phones and laptops even at night and also offline.

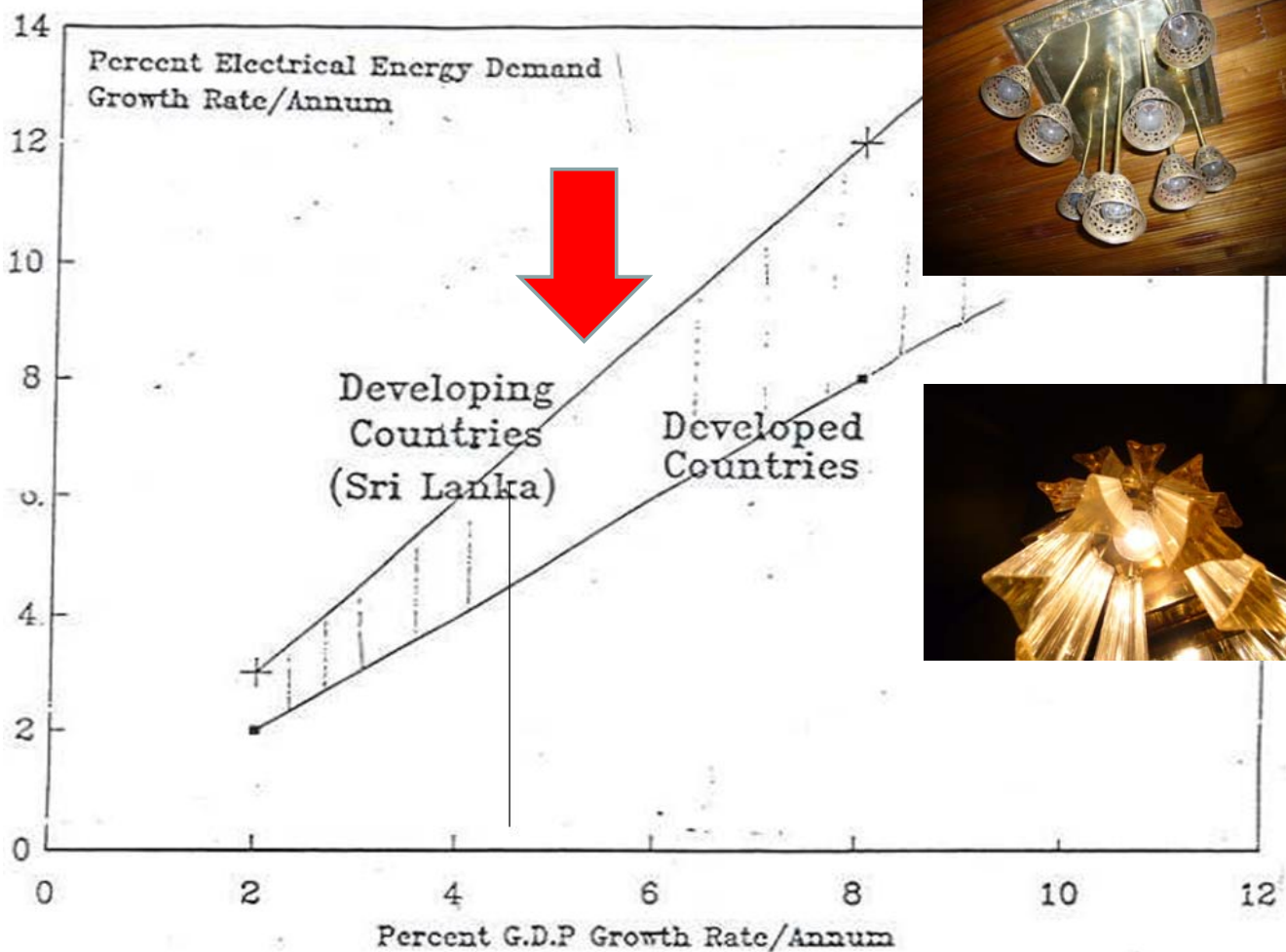


**SOLAR STORAGE TILE ....**

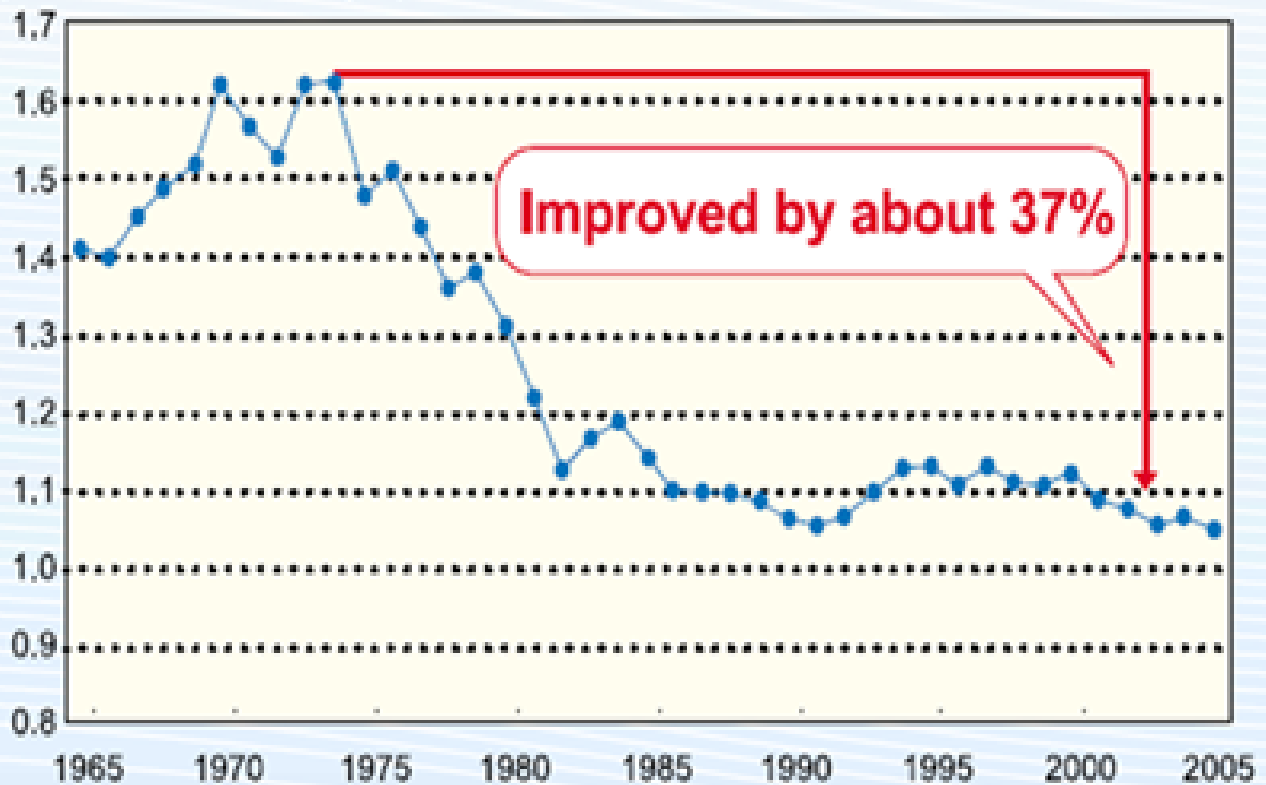


# Energy Efficiency

- Smart Grid
- **Green Building**
- Cogeneration
- **Tri generation**
- Electronics and Appliances
- **Semiconductors**

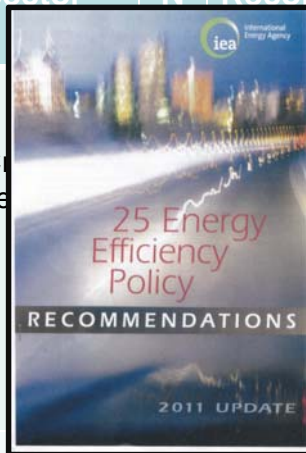


(In terms of ton of oil / trillion yen )

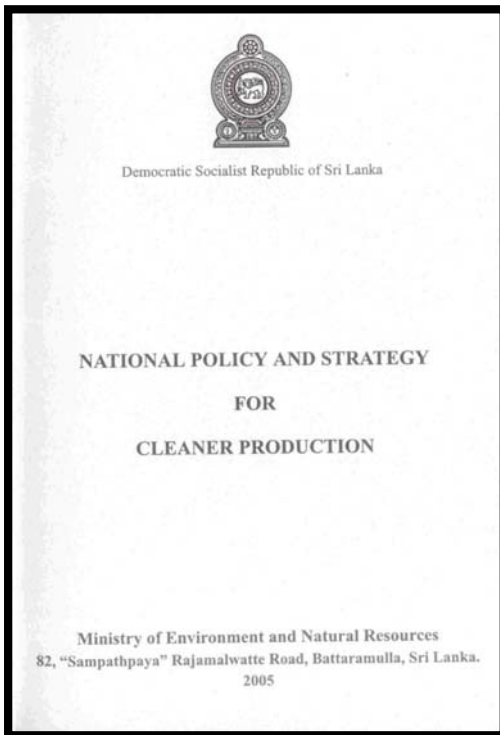


# JAPAN – AN EXAMPLE

| Sector                 | N                             | Recommendation                 | Sector           | N                           | Recommendation                            |
|------------------------|-------------------------------|--------------------------------|------------------|-----------------------------|---|
| Case studies           | 1                             | Collection & Indicators        | Lighting         | 14                          | Phase-out of inefficient ones             |
|                        | 2                             | Policies & action plans        |                  | 15                          | Energy-efficient lighting systems         |
|                        | 3                             | Competitive energy markets     | Transport        | 16                          | Mandatory vehicle FE standard             |
|                        | 4                             | Investment in efficiency       |                  | 17                          | Measures to improve vehicle FE            |
| 5                      | Training, etc.                | 18                             |                  | FE non-engine components    |   |
| Buildings              | 6                             | Mandatory building codes       | 19               | Eco-driving                 |   |
|                        | 7                             | Net-Zero energy consumption    | 20               | Transport system efficiency |   |
|                        | 8                             | Improved energy efficiency     | 21               | Energy management           |   |
|                        | 9                             | Building energy labels, etc.   | Industry         | 22                          | High-efficiency equipment, etc.           |
| 10                     | Energy performance of systems | 23                             |                  | Energy efficiency services  |   |
| Appliances & Equipment | 11                            | Mandatory MEPS and labels      |                  | 24                          | Complementary policies                    |
|                        | 12                            | Test standards & protocols     | Energy Utilities | 25                          | Utility end-use energy efficiency schemes |
|                        | 13                            | Market transformation policies |                  |                             |   |







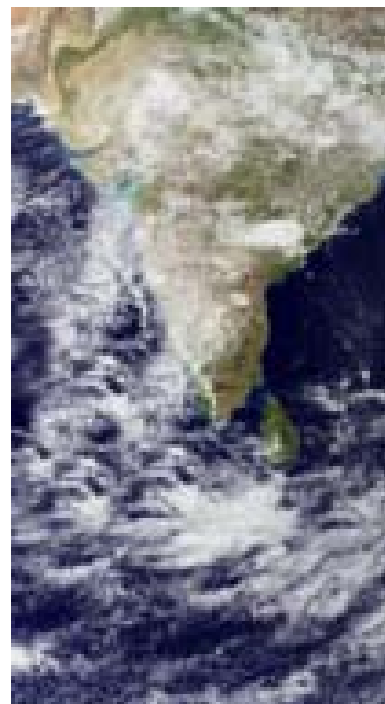
# Policy Goals

1. Achieve Sustainable Development in Sri Lanka
2. Improve Environmental Quality throughout Sri Lanka
3. Improve eco-efficiency across all sectors of the economy in Sri Lanka
4. Alleviate Poverty and Improve the Living standards of all Sri Lankans

**Need for that Belief ...this is Doable!**

## Transportation

- Vehicles
- Traffic Management
- Fuelling
- Charging infrastructure





ELCA

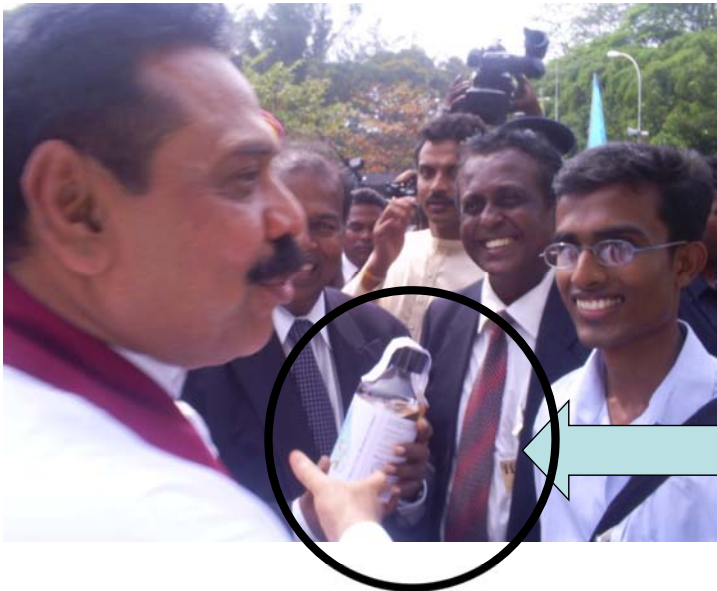


**MAHINDRA REVA**

Electric Vehicles  
SMART Cars  
Hydrogen Vehicles



**HyAlfa**



Bioethanol

@CPE

Univ of Moratuwa



Biogas

2006

**BIOFUELS**

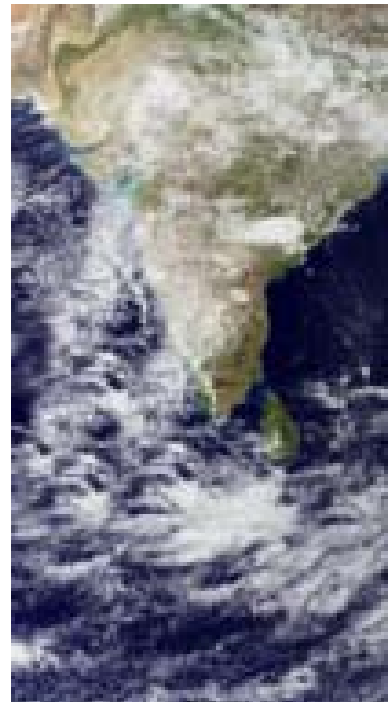
National Policies..?!





# Air and Environment

- Carbon sequestration
- **Carbon trading / offsets**
- Emissions control
- **Bioremediation**
- Recycling and Waste
- **Monitoring and Compliance**



1.0 MW power project based on cattle dung at Haebowal  
Dairy Complex Ludhiana, Punjab



3000 cum biomethanation project for solid waste  
at Slaughterhouse in Andhra Pradesh

# MAS Thurulie – LEEDS Platinum!



Find a Job | Dating | Wine | Our Papers | Feedback | My Stories Friday, May 6

# MailOnline

Home News U.S. Sport TV&Showbiz **Femail** Health Science&Tech Money Debate

Femail Home | Food | Pictures | Femail Boards | Fashion Store | Beauty | MyDish Recipe Finder

## Carbon Ne Product R Lea

### BRAIN TRAINING GAMES

- Intelligence
- Memory
- Attention
- Focus
- Speed
- Language

### Visual

- Spatial
- Math
- Intelligence

## This is not just lingerie: M&S unveil world's first carbon neutral bra

By DAILY MAIL REPORTER  
Last updated at 7:44 AM on 14th April 2011

[Comments \(36\)](#) [Add to My Stories](#)

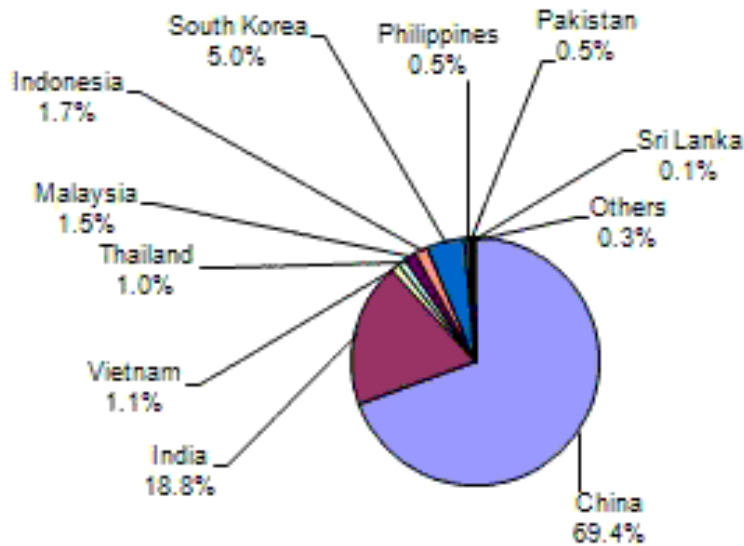
Eco labels have become increasingly popular as shoppers make more effort to consume environmentally friendly products.

But now Marks & Spencer has made 'going green' even easier as it today launched the high street's first ever carbon neutral bra.

Part of the new Autograph Leaves lingerie collection, the retail chain has calculated the footprint of the entire range, which includes four styles of bra, three knickers and a set of suspenders.

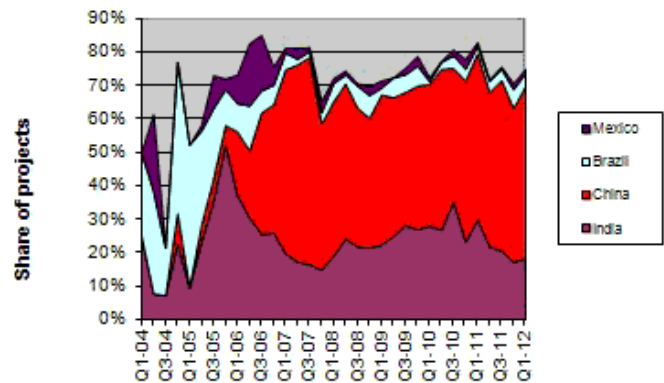


CER's - 2012



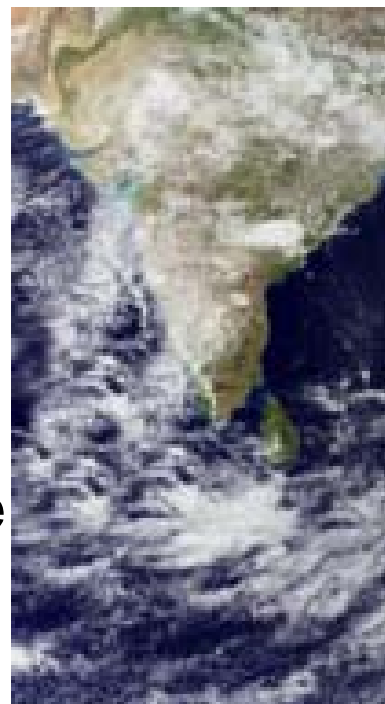
# CHINDIA!

## CDM - 2012

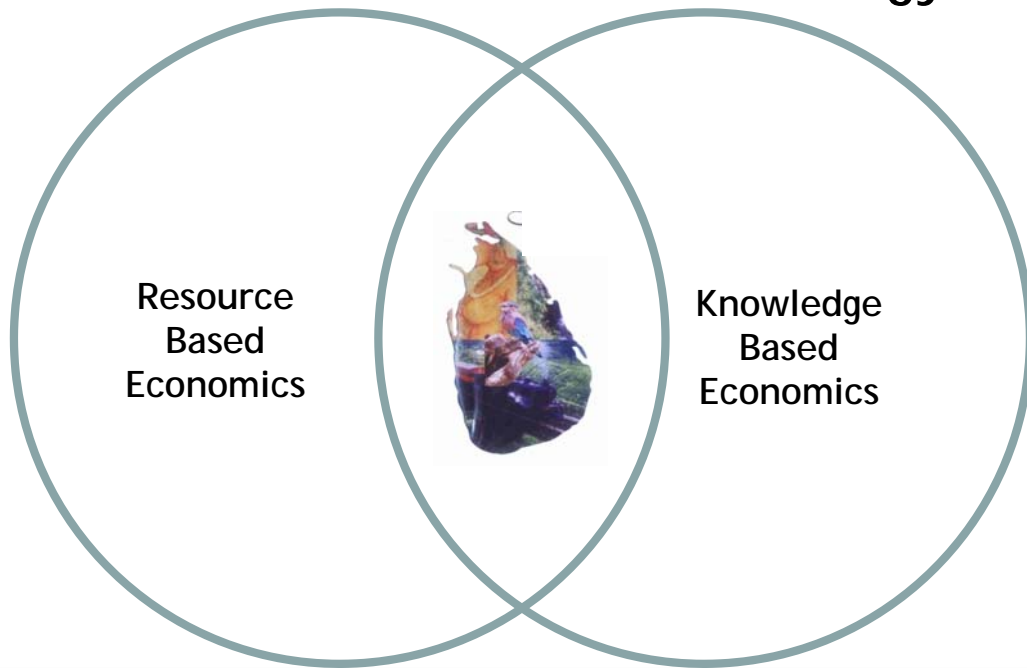


## Clean Industry

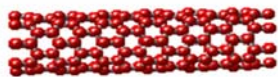
- Advanced Packaging
- Design Innovation
- Materials Innovation
- Equipment innovation
- Production
- Monitoring and Compliance



# A New Development Paradigm for Sri Lanka - with nanotechnology



**Nanomaterials**



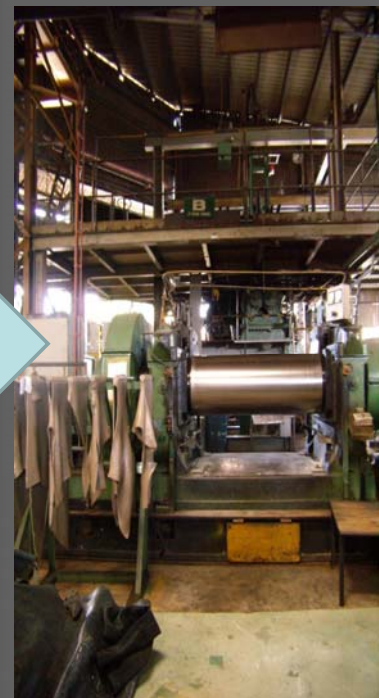
**Nanoservices**



**Value Chain**

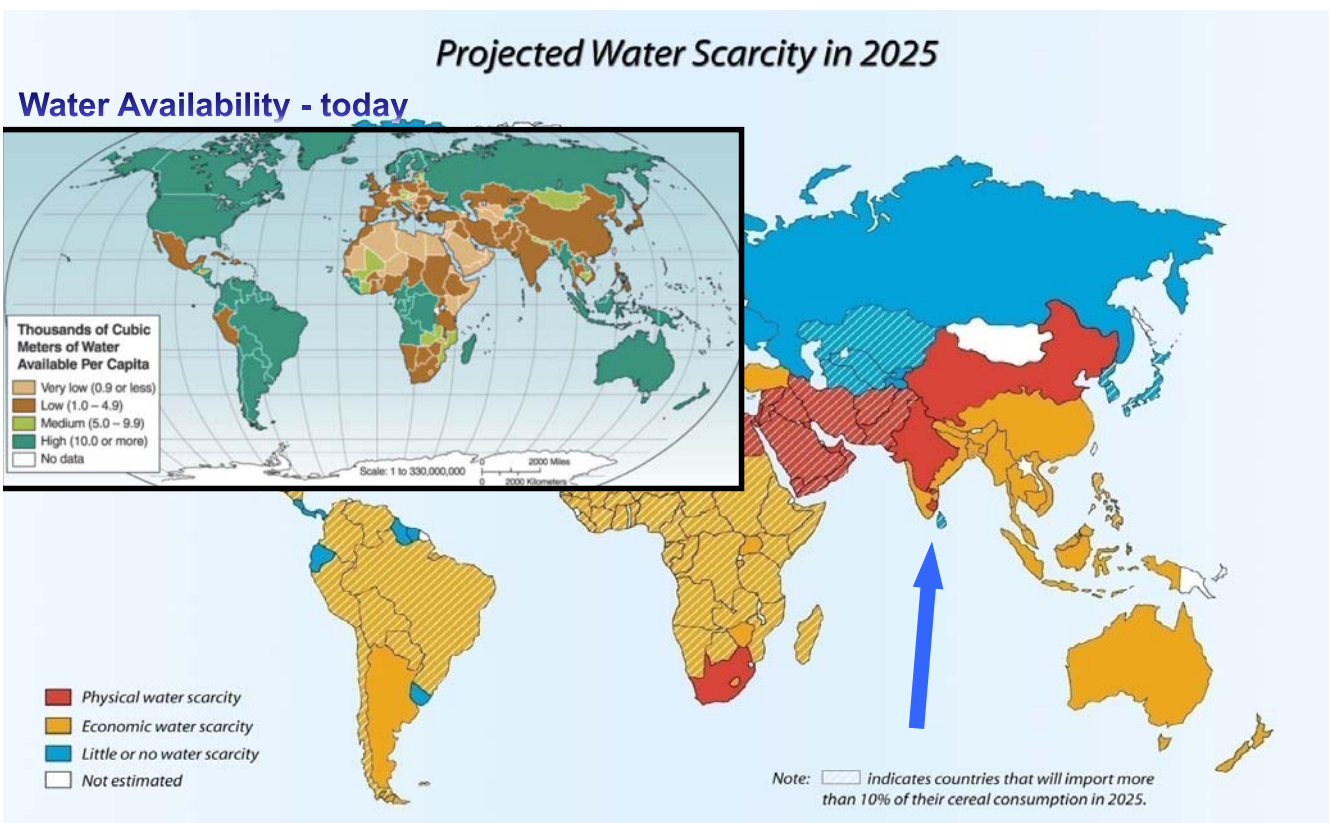
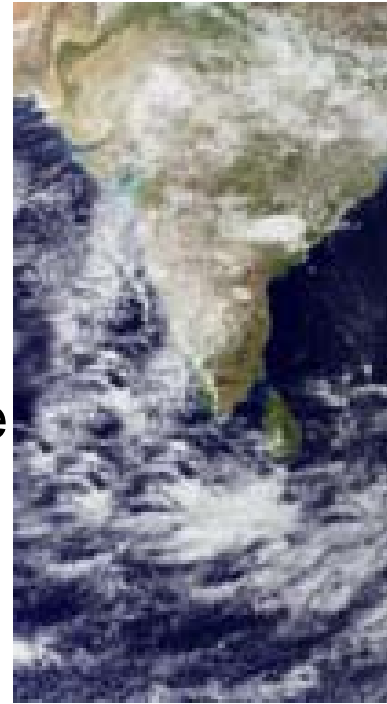


**Nanointegrated Manufacturing**



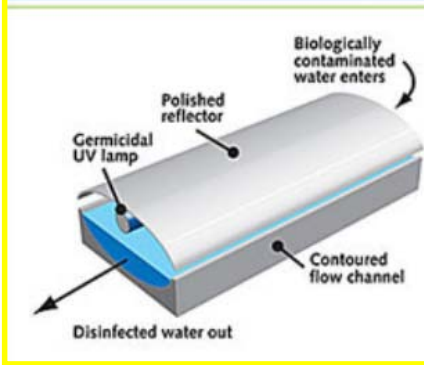
# Water

- Sourcing and generation
- Treatment
- Transmission
- Efficiency
- Monitoring and Compliance



Right Pricing of Water .....





16 solar and hydro-powered ozone water purifier units have been installed in the Annapurna area by ACAP (KMTNC)/ Empower Consultants/ Lotus Energy called SPOWTS (Solar Powered Ozone Water Treatment Systems).

Nepal

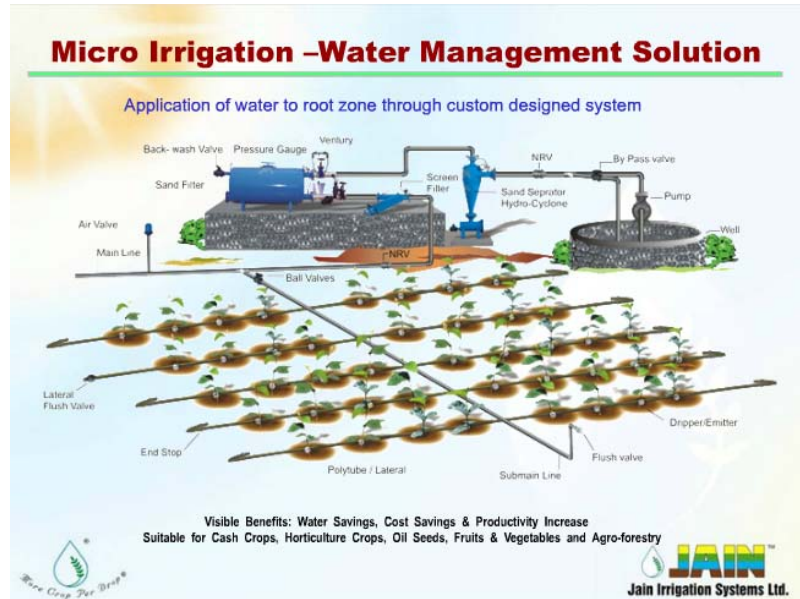
# WHI – UV water treatment

## Agriculture

- Crop Treatment
- Land Management
- Aquaculture



# Championing Sustainable Agriculture



## Greening Fertilization (more from less and much less to pollute)







US 20110296885A1

(19) **United States**

(12) **Patent Application Publication**  
Nilwala et al.

(10) **Pub. No.: US 2011/0296885 A1**

(43) **Pub. Date: Dec. 8, 2011**

(54) **COMPOSITIONS FOR SUSTAINED RELEASE OF AGRICULTURAL MACRONUTRIENTS AND PROCESS THEREOF**

**Publication Classification**

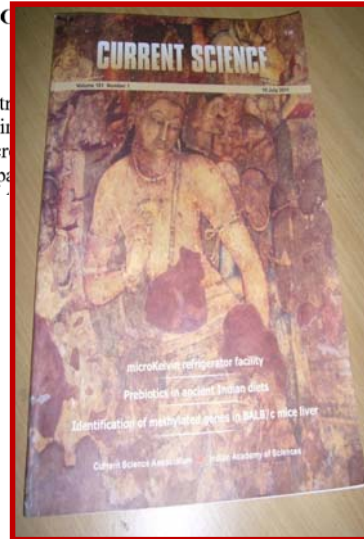
(75) Inventors: **Kottegoda Nilwala**, Horana (LK); **Imalka Munaweera**, Haputhale (LK); **A. Nadeesh Madusanka**, Battaramulla (LK); **Veranja Karunaratne**, Kandy (LK)

(51) **Int. Cl.**  
**C05C 9/00** (2006.01)  
**C05B 17/00** (2006.01)

(73) Assignee: **SRI LANKA INSTITUTE OF NANOTECHNOLOGY (PVT) LTD.**, Malwana (LK)

(52) **U.S. C** 1/42

(57) A macronutrient locus containing macronutrient hydroxyapatite... plant concept of related



# Nanotechnology Development



**SLINTEC strikes deal with Indian firm for Next-Gen nano solutions**

The Sri Lanka Institute of Nanotechnology Pvt Ltd (SLINTEC) entered into an agreement with Hyderabad-based Nagarjuna Fertilizers and Chemicals Ltd (NFCL) for the purchase of SLINTEC's first generation of nano plant nutrition products yesterday.

NFCL further agreed to a long-term strategic technology development programme with SLINTEC for the second and third generation of nano plant nutrition products, investing approximately US\$3 million into SLINTEC's research over the next three years.

"Our vision is to make Sri Lanka a destination for Nanotechnology Research and Development (R&D). This strategic partnership with Nagarjuna Group of India, a global leader in chemicals and fertilizers, is our first step toward achieving this vision," SLINTEC Chairman Mahesh Amalean said.

**Contd. on Page 7**

Indian High Commissioner Ashok Kantha (extreme left) and Minister for Technology and Research Pavithra Wanniarachchi (extreme right) look on as Senior Advisor Nagarjuna Fertilizers and Chemicals Ltd R.S. Nanda (second from left) and SLINTEC Chairman Dr. Mahesh Amalean exchange agreements -Pic by: Manoj Ratnayake



# CleanTech Hurdles

- Sustainability Mindset ..... Much more desired
- **Small markets ... inhibitory size**
- Thinking as just another business opportunity
- **Technology transplanted .... Lot less innovation driven**
- Agency mindset .....
- **Policy framework deficiencies**
- South-South Technology transfer



**The Present Day: Multiple regional sources of cleantech innovation are rapidly spreading globally.**

**INNOVATION?**

# The Blue Economy

A Report to the Club of Rome 2009

10 years  
100 innovations  
100 million jobs  
inspired by nature

Prof. Dr. Gunter Pauli

Founder Director of the ZERI Foundation

Member of the Club of Rome

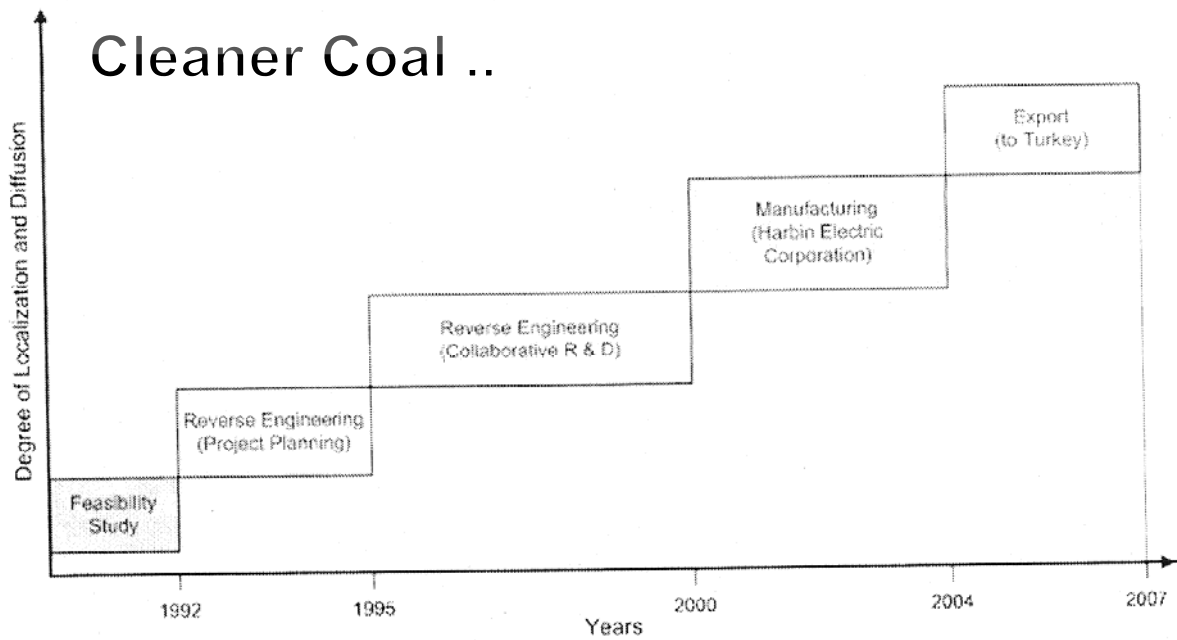
Professor Systems Design at the Faculty of Architecture Politecnico di Torino

© 2009, Pauli



Jorge Alberto Vieira Costa  
UFRG

Convert flue gas to Probiotic  
food and Biodiesel  
**and Jobs**



Localization process of SC technology in China.

## LOCALIZATION – SC IN CHINA



**Society  
expects the Technology  
to pull us out of this  
MESS!**