

**Centre for Science and Environment
ANNUAL MEDIA BRIEFING ON CLIMATE CHANGE**

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**Basement Theatre, India Habitat Centre,
Lodhi Road, New Delhi, India.**

Session on

'Global Compact on Renewable Energy - Why Asia and Africa Needs to Come Together'

**100% Renewable Energy Target in Sri Lanka
– Making a Reality –**

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06th November 2015

OUTLINE

- ❑ Country at a Glance
- ❑ National Energy Scenario
 - Role of Renewable Energies
- ❑ 100% RE Scenario – Overall Concept
 - Economy
 - Electricity system
- ❑ 100% RE Scenario – Sectoral Approach
 - Transport
 - Residential
 - Industry
 - Commercial
- ❑ Development of Renewable Energy
 - Strategic Approach
- ❑ Success Stories
- ❑ Conclusions.

COUNTRY AT A GLANCE

□ Socio-Economic

- ✓ Population : 20.5 Million
- ✓ Per Capita GDP: 3,600 US\$

□ Energy Sector

✓ Primary Energy Supply by Sources:

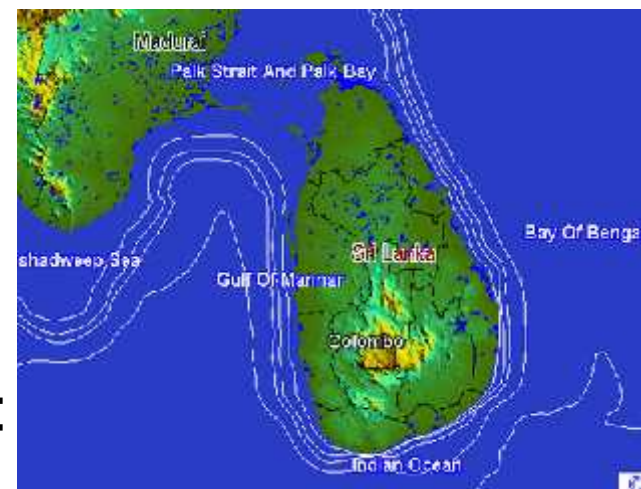
- Petroleum & Coal : 49.8%
- Biomass : 43.3%
- Large hydro : 4.3%
- NREs (Small hydro, wind, solar): 2.6%

✓ Energy Consumption by Sectors:

- Industry : 25.4 %
- Transport : 28.8 %
- Domestic & Commercial: 45.8 %

✓ Electricity Sector:

- Total Installed Capacity: 3900 MW
- Peak Load : 2200 MW
- HH electrification : 99% (Grid Access - 96% + Off-grid - 3%)



Generation by Source

- Hydro : 30%
- Thermal: 60%
- NRE : 10%

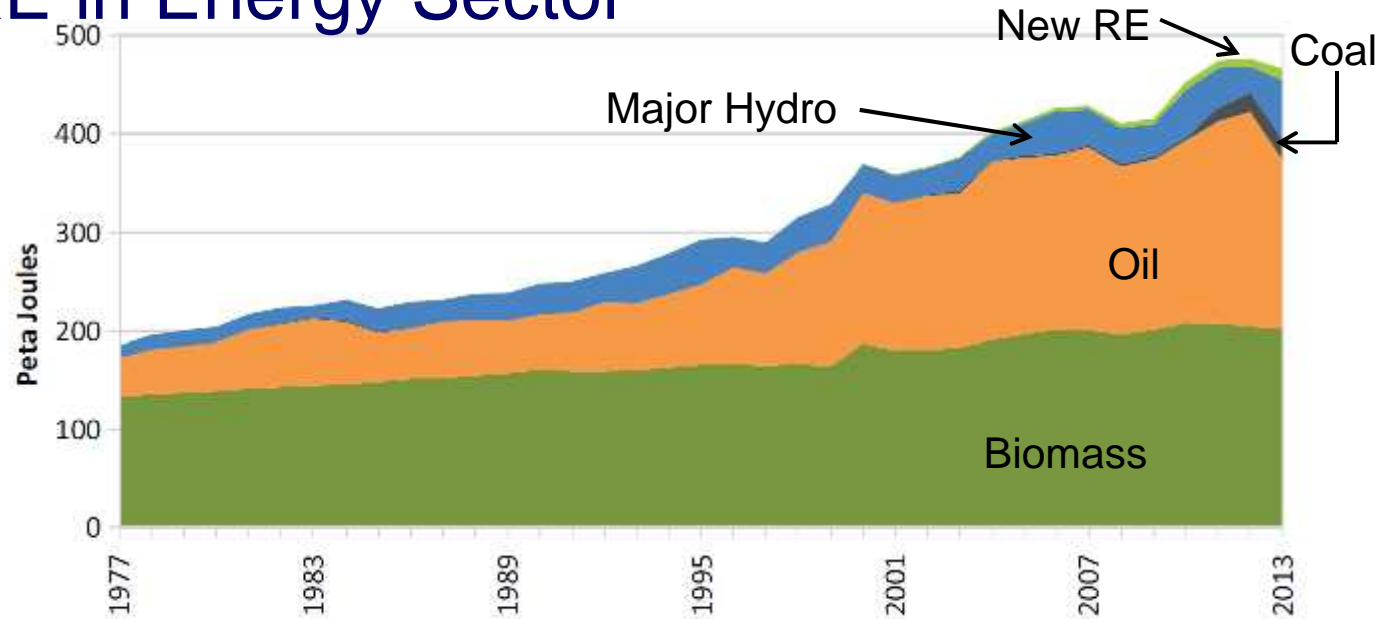
NRE Capacities

- Small hydro: 310 MW
- Wind : 125 MW
- Solar : 15 MW
- Biomass : 20 MW

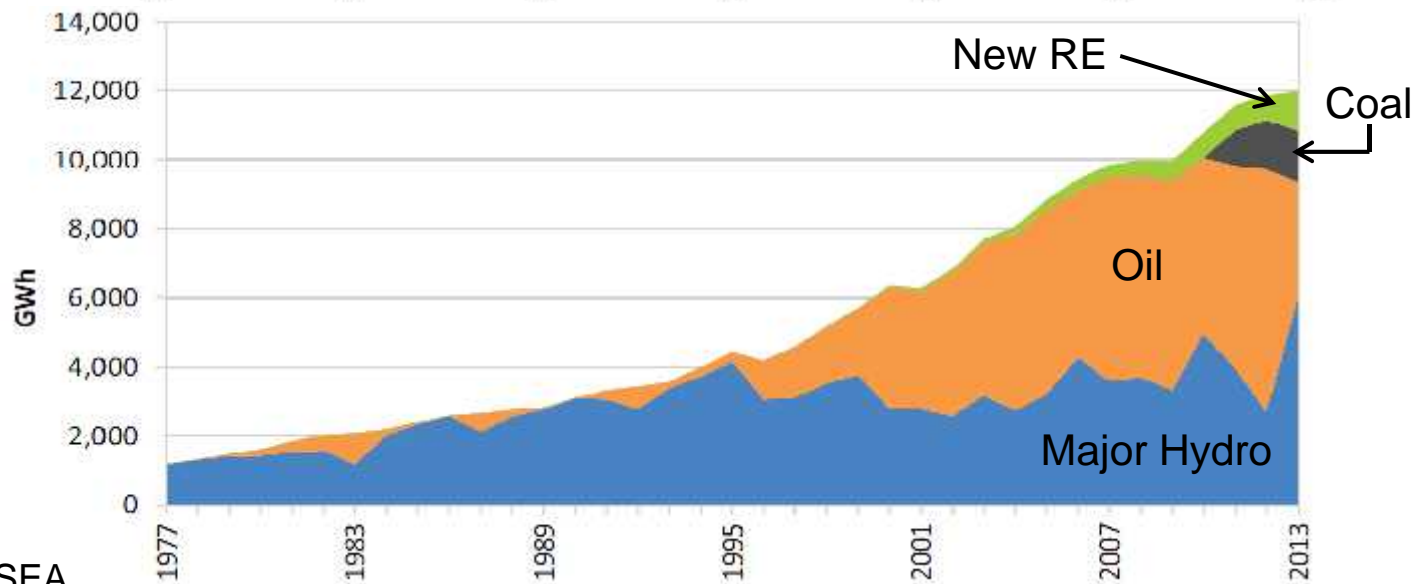
NATIONAL ENERGY SCENARIO

□ Role of RE in Energy Sector

Primary Energy Supply by Source



Gross Electricity Generation of Grid Connected Power Plants

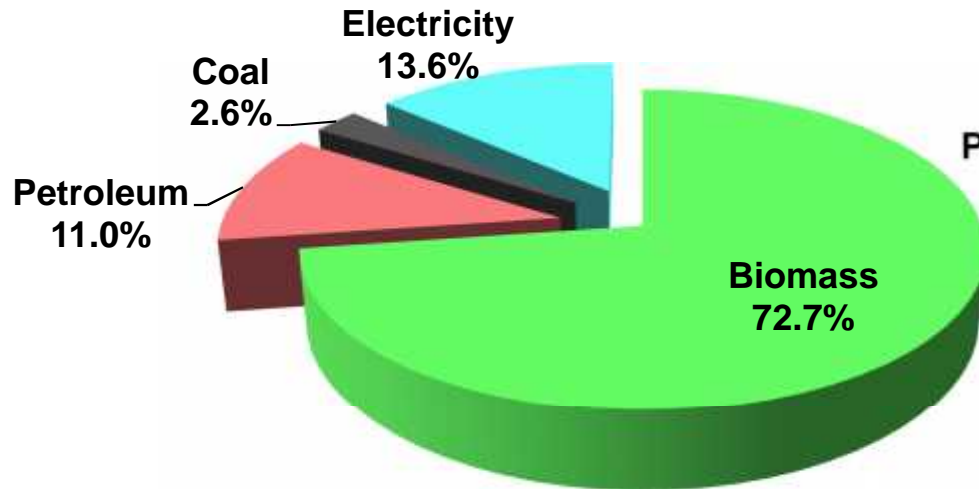


Source: SLEB-2013, SLSEA

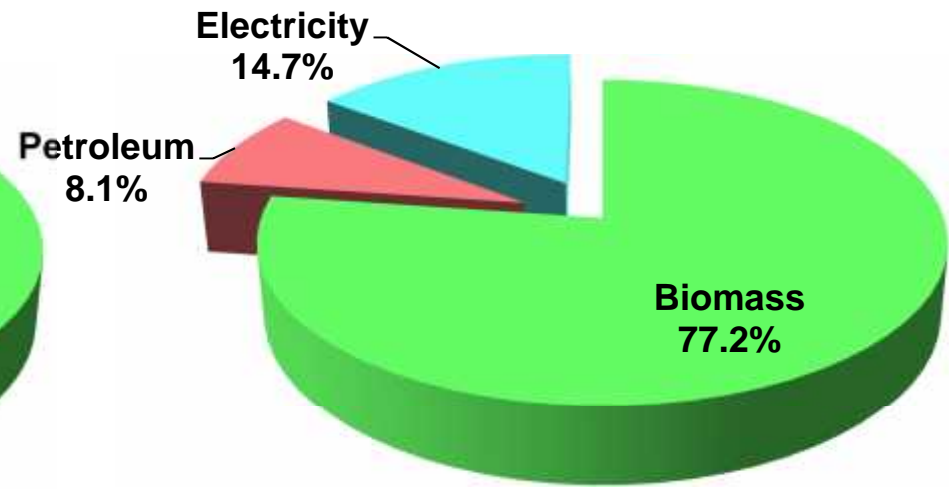
NATIONAL ENERGY SCENARIO

□ Role of RE in Energy Sector

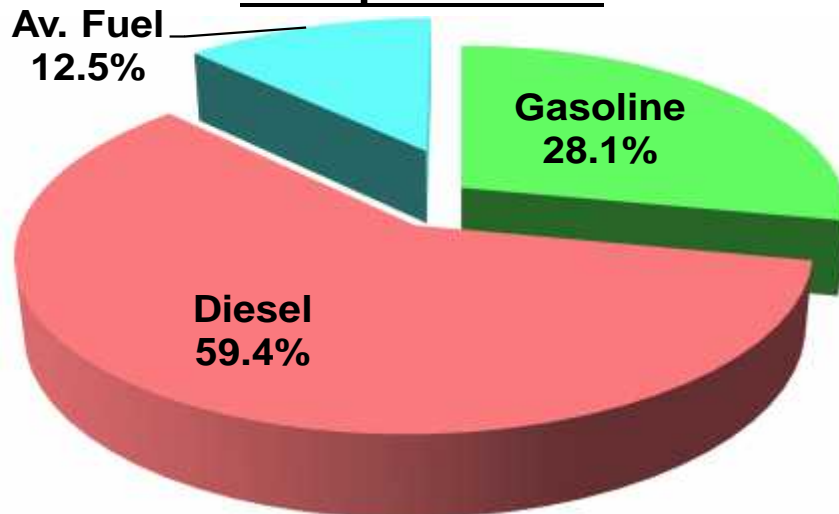
Industrial Sector



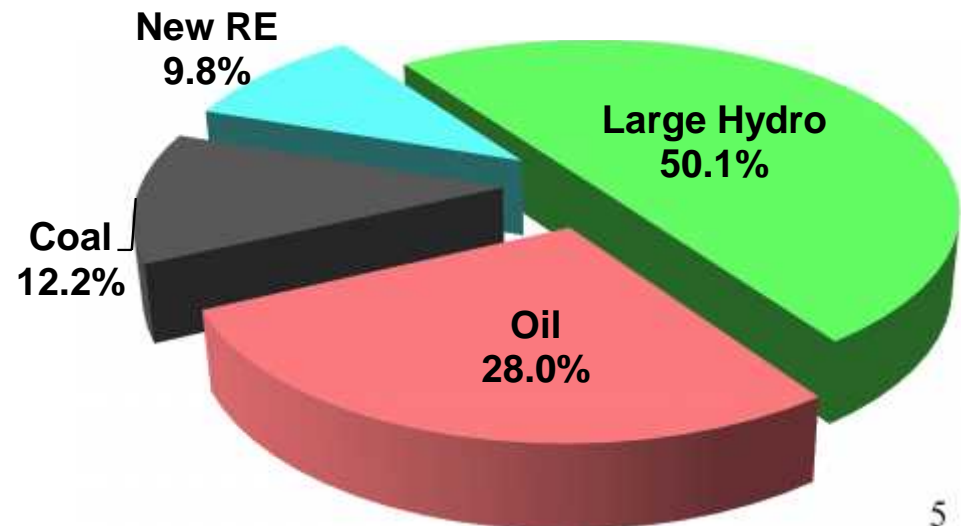
Household, Commercial & others Sector



Transport Sector



Electricity Sector



100% RE SCENARIO – OVERALL CONCEPT

- ❑ Stable population of around 23 million people, transformed to energy conscious society
- ❑ Developed, knowledge based economy → 18000MW demand
 - ✓ Lowered to 15,000MW due to low energy intensity of economy
 - ✓ Further lowered by EE gains to 10,000MW (≡ 10 kWh/person/day)
- ❑ A transformed society
 - ✓ With full digital convergence - Integrated mostly electronically
 - ✓ Knowledge society and Energy conscious nation.

- ❑ Electricity system
 - ✓ Taken over the most aspects of the energy industry through an Internet Protocol (IP) based smart grid
 - ✓ Powered, mostly by centralized wind parks and distributed solar PV, assisted by storage hydro
 - ✓ Biomass, agro and municipal waste streams supporting firm power
 - ✓ EV batteries & pumped storage developed to support the RE fed grid
 - ✓ Hence size of the grid increased to 25,000MW

100% RE SCENARIO – SECTORAL APPROACH

TRANSPORT

- Complete electrification of transport realized
- ✓ Most major cities will be predominantly pedestrian in character and will have only electric bicycles, scooters, E3Ws and E-taxis to support
- ✓ Passenger transport dominated by electric trains and electric BRT supported by a fleet of EV taxis
- ✓ Storage capacity of EVs used as a grid balancer
- ✓ Hydrogen Fuel cell vehicles, Compressed air vehicles
- ✓ Algae based biofuels and compressed biogas powering long haul transport.

RESIDENTIAL

- Almost all homes defected from central grid
- ✓ Own roof top solar PV with advanced battery solutions
- ✓ Energy efficient appliances, mostly connected to DC micro grids
- ✓ Cooking energy, a combination of modern biomass and induction stoves
- ✓ Solar water heaters
- ✓ Waste converter (including biogas digester), a household appliance. 7

100% RE SCENARIO – SECTORAL APPROACH

INDUSTRY

- Industries are resource efficient low energy demand types
- ✓ Thermal energy from improved biomass, biogas and RDF
- ✓ Solar air heaters / water heaters; Solar water pumping for lift-irrigation
- ✓ Geothermal, Ocean thermal for low temperature thermal energy
- ✓ Electricity from local grids, and assisted by central grid
- ✓ DC motors taking over the role of preferred motive power source.

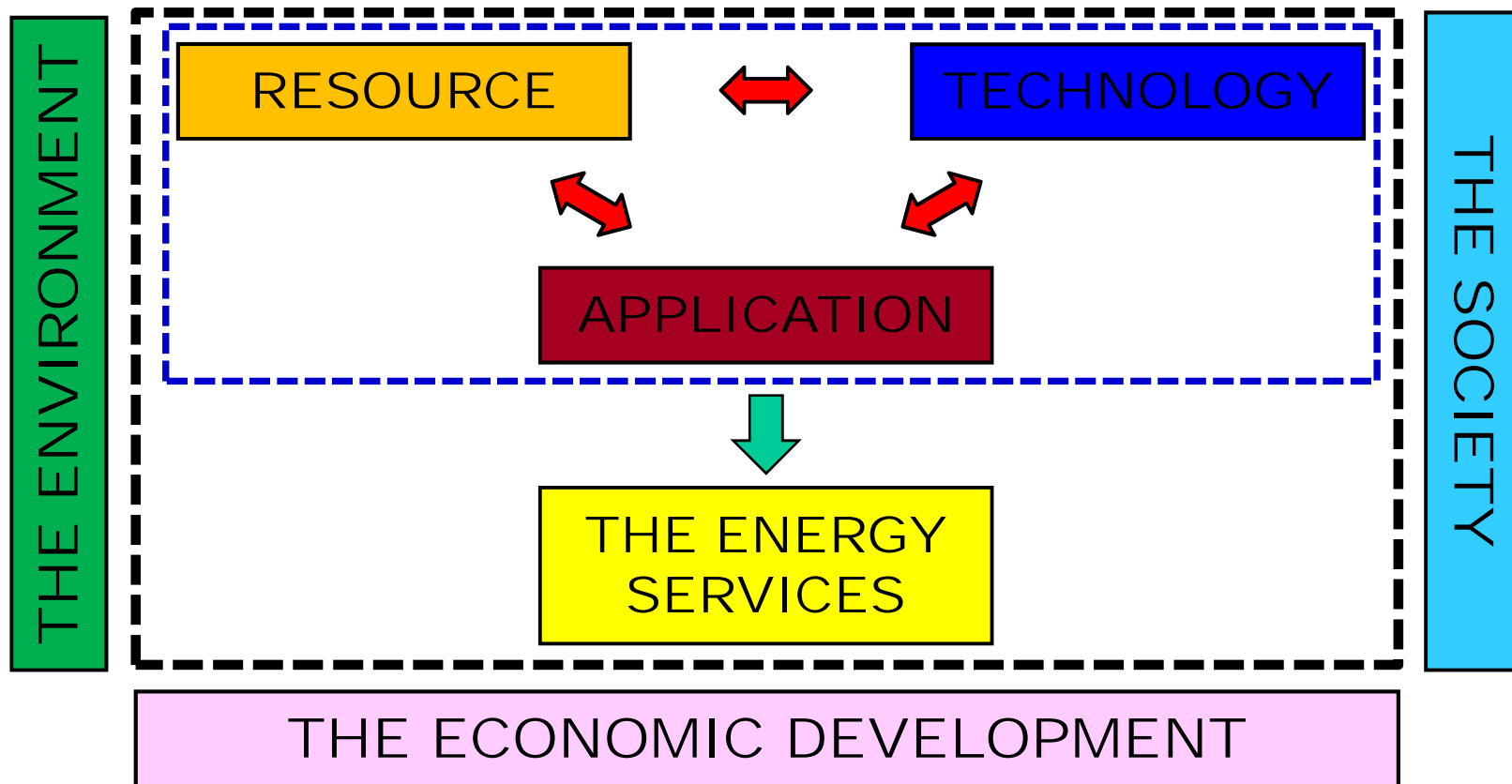
COMMERCIAL

- Building innovations driven commercial sector
- ✓ Most commercial centres cooled by district ocean thermal and geothermal assisted by ice storage
- ✓ Most buildings energy efficient – net zero / positive energy buildings
- ✓ All buildings with advanced BMS systems and Building-Integrated Photovoltaic (BiPV) envelopes
- ✓ Advanced technologies such as co-generation and tri-generation
- ✓ Waste to Energy - fully materialized.

This is assisted by RE and EE Technology Roadmaps

DEVELOPMENT OF RENEWABLE ENERGY

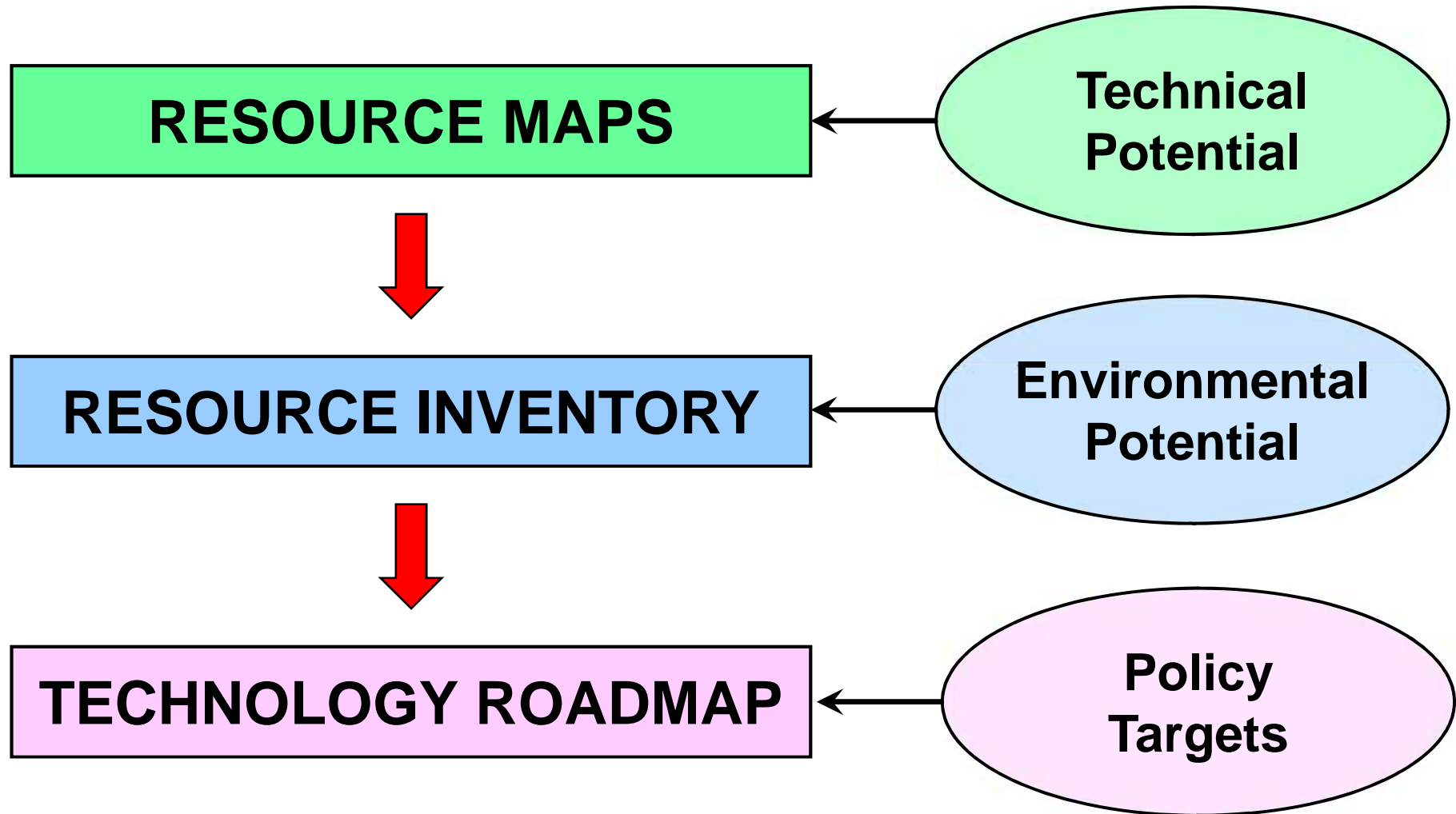
□ The Strategic Approach



- Proposed to introduce sustainability dimensions (Financial, Social and Environmental) in technology selection.

DEVELOPMENT OF RENEWABLE ENERGY

□ The Strategic Approach



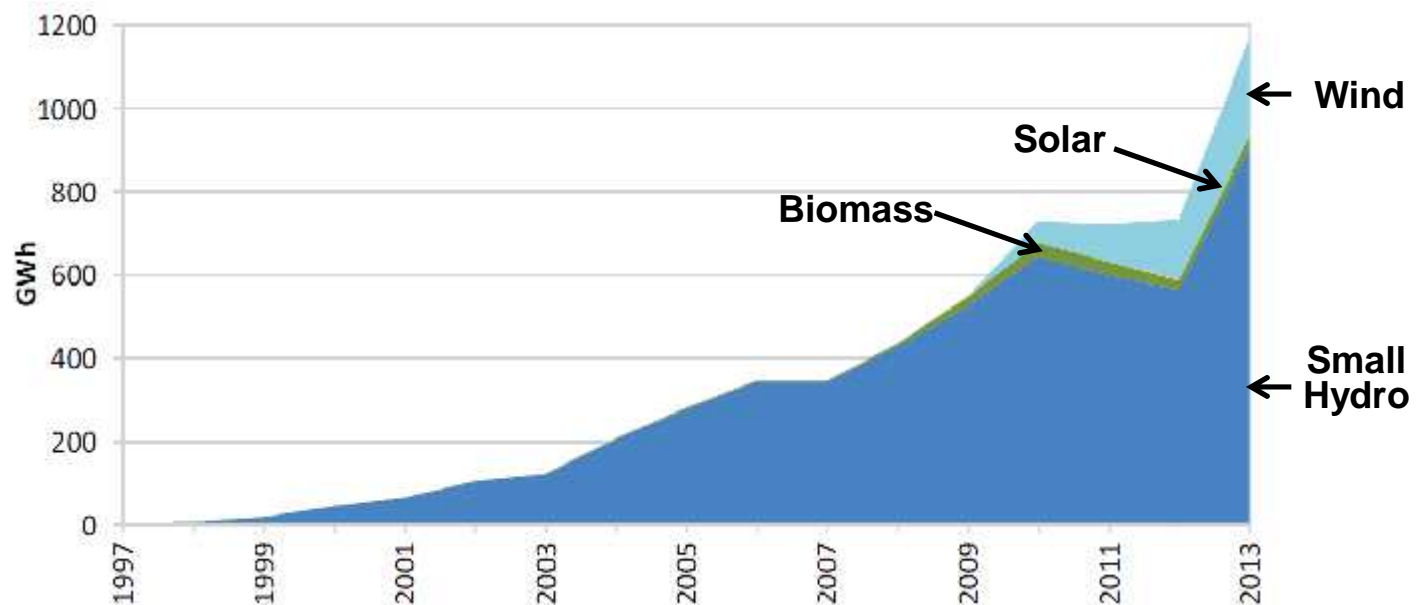
SUCCESS STORIES

□ The Progress of Grid-connected NREs

Installed Capacities

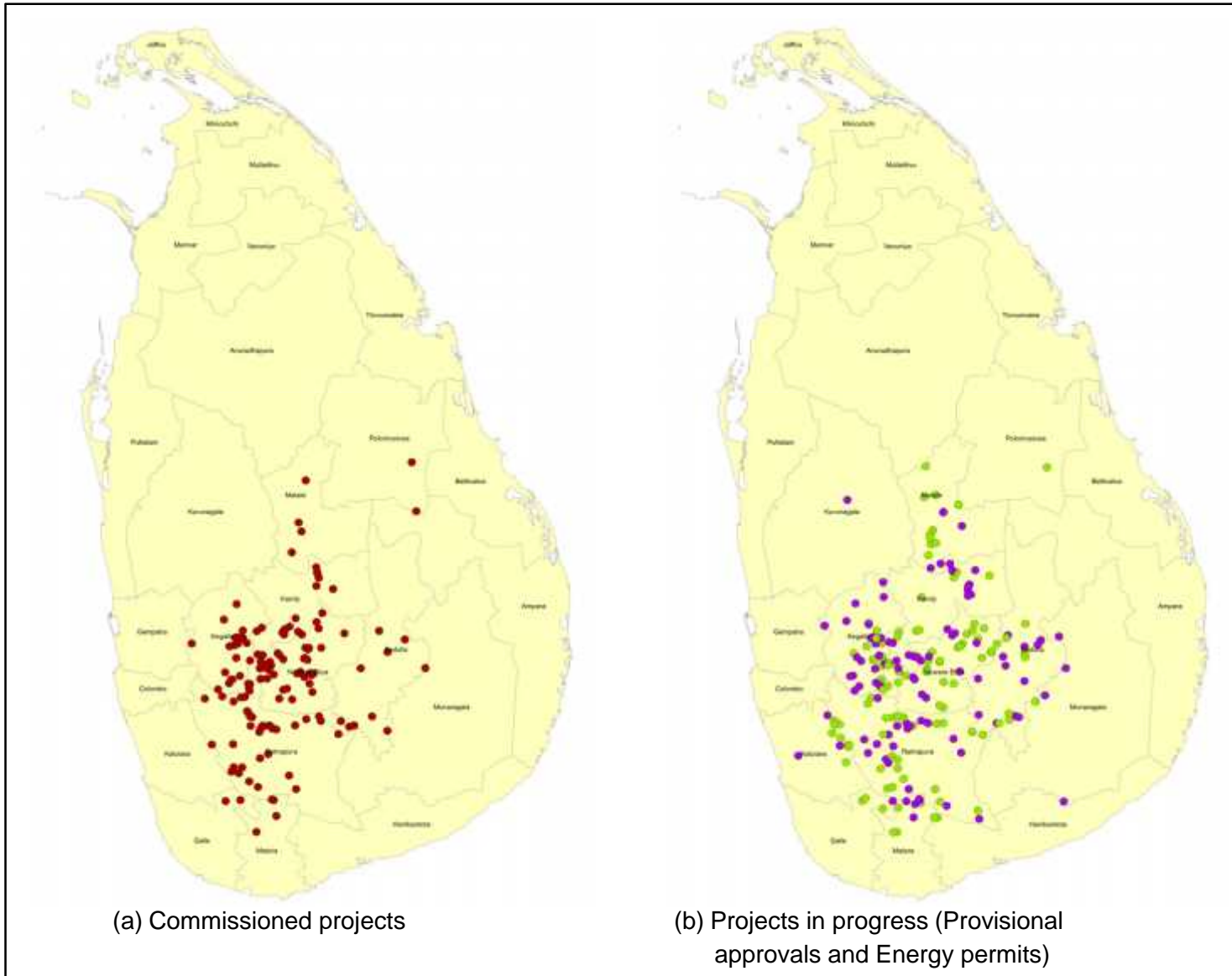
Type	Commissioned		Energy Permit	
	Projects	MW	Projects	MW
Small Hydro	147	302.77	180	295.55
Dendro	3	10.50	22	102.53
Agro Waste	3	13.00	3	2.21
Municipal Waste	-	-	2	20.00
Solar	3	1.36	8	80.00
Wind	15	128.45	2	101.01
Total	171	456.08	217	601.30

Gross Electricity Generation



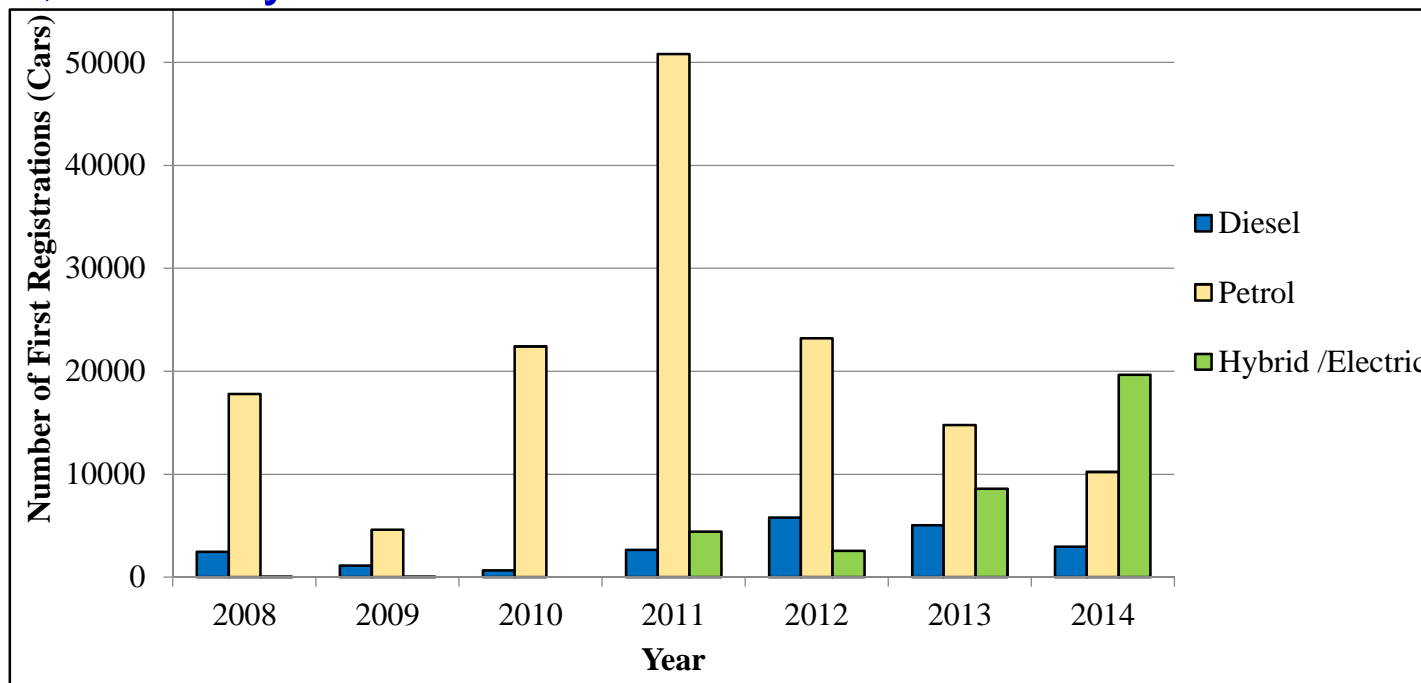
SUCCESS STORIES

Small Hydro Development



SUCCESS STORIES

- Solar Net Metering:
 - 3000+ Systems
 - 15 MW
 - 100+ Companies
- EV + Hybrid Cars
 - 50,000+ Systems

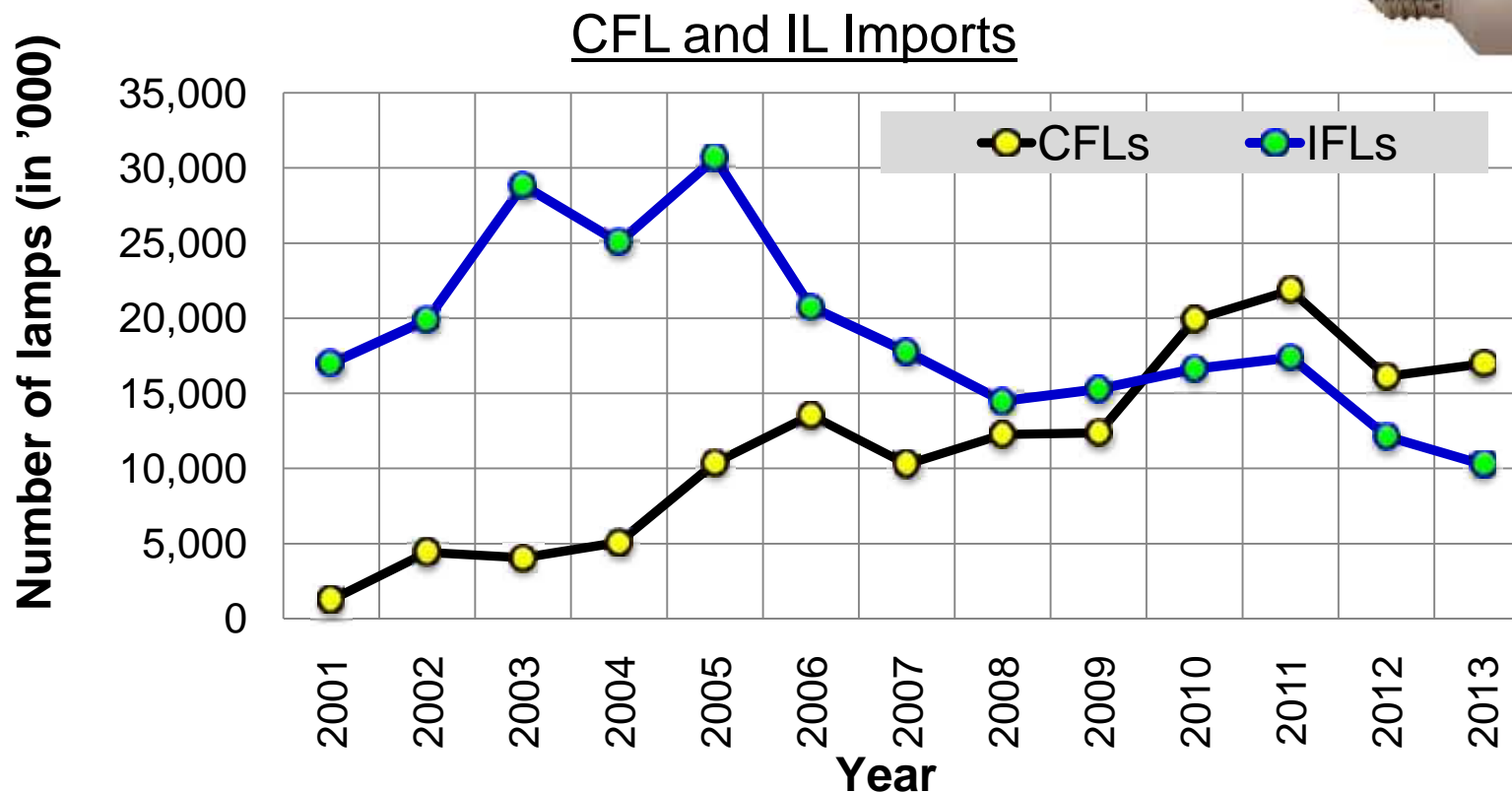


SUCCESS STORIES

□ Energy Efficiency

✓ Lighting - CFL

- More than 80% penetration in households
- Savings: 280 GWh/yr (~300 MW peak load)



SUCCESS STORIES

- Awareness & education programmes
 - ✓ For all the sectors of the community.



In establishing a Knowledge Society
and Energy Conscious Nation

CHALLENGES IN THE RE SECTOR

□ General Challenges

- RE resources are mostly dispersed in nature and characterized by lower energy densities
 - ✓ Thus demanding efficient conversion technologies to be utilized for the competitiveness in the energy market
 - ✓ Basically, environmental and social benefits along are not adequate to promote and commercialize RE technologies.
- Lack of capacity and knowhow in using sound methodology in project planning and implementation
 - ✓ Failure to performance characterization of technologies against the on-site attributes of the RE resource, the intended end-use application/s & other local circumstances
 - ✓ Inadequate R&D efforts
 - ✓ Failure to capture immerging technologies (e.g. smart grid)
 - ✓ Lack of capacity for local value addition / manufacture
 - ✓ Very limited inventions & innovations efforts.

CHALLENGES IN THE RE SECTOR

□ Challenges for RE Electricity Generation

- Constraints in national grid in absorbing RE based electricity
 - ✓ Exceeding substation / transmission capacities
 - ✓ Time / seasonal variability + Lack of storage options
 - ✓ Non-dispatchable generation
 - ✓ Limitations in Peak-matching
 - ✓ Geographical mismatch of resource and demand
- Lack of dynamic modelling / advanced forecasting tools and technical knowhow
- Limited of long-term resource data
- Higher initial costs of new REs / Subsidies for fossil fuels
- Issues of prevailing Feed-in-Tariff methodology
- Limited access to “green-funding”.

CONCLUSIONS

- ❑ Sri Lanka has a high potential of number of RE resource, but harnessing of these resources for providing high quality energy services at competitive prices is still a challenge in all end-use sectors.
- ❑ The optimum utilization of RE resources for socio-economic development is still possible, but requires methodological approach for formulation and implementation of RE development programmes.
- ❑ For the RE sector to develop, it is essential that the ESTs are adopted, while establishing conducive environment for programme development.
- ❑ Such efforts could be well supported by introducing innovative financial mechanisms, for which green funds could be used.

Thank You

DEVELOPMENT OF RENEWABLE ENERGY

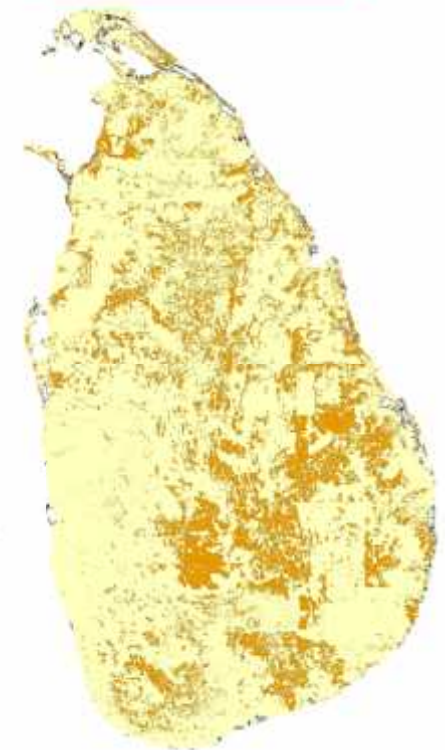
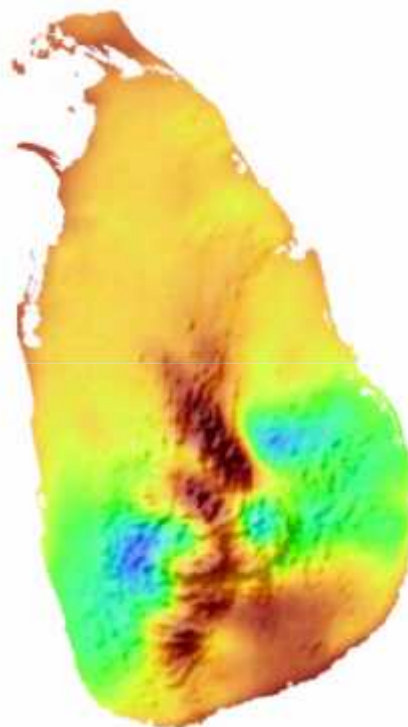
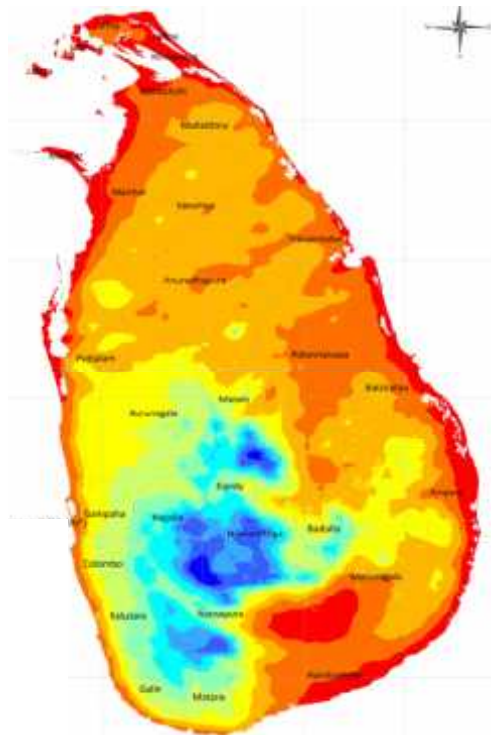
RE Resource Maps

Solar

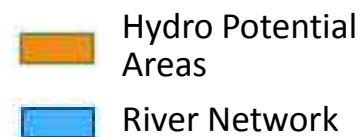
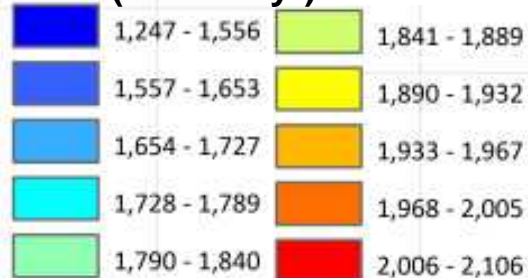
Wind

Hydro

Biomass

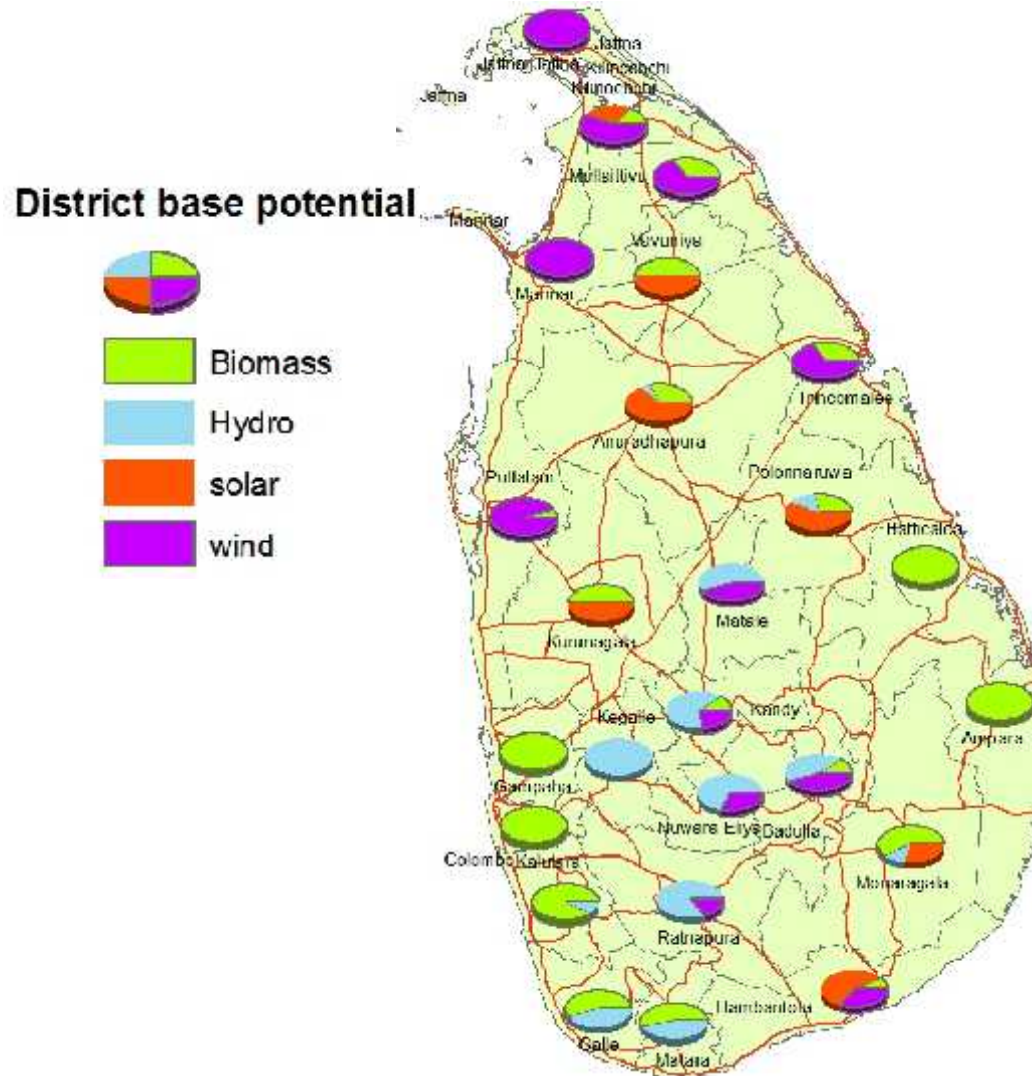


(kWh/m²/yr)



DEVELOPMENT OF RENEWABLE ENERGY

RE Resource Inventory For medium term development



No	District	Biomass	Solar	Wind	Hydro	Total
1	Ampara	30	0	0	0	30
2	Anuradhapura	15	30	0	2	47
3	Badulla	15	0	60	61	136
4	Batticaloa	15	0	0	0	15
5	Colombo	40	0	0	0	40
6	Galle	15	0	0	12	27
7	Gampaha	5	0	0	0	5
8	Hambantota	15	100	60	1	176
9	Jaffna	0	0	100	0	100
10	Kalutara	30	0	0	3	33
11	Kandy	15	0	30	80	125
12	Kegalle	0	0	0	94	94
13	Kilinochchi	15	30	60	0	105
14	Kurunegala	30	30	0	0	60
15	Mannar	0	0	260	0	260
16	Matale	0	0	30	38	68
17	Matara	15	0	0	13	28
18	Monaragala	30	15	0	6	51
19	Mullaittivu	15	0	30	0	45
20	Nuwara Eliya	0	0	60	133	193
21	Polonnaruwa	15	30	0	8	53
22	Puttalam	15	0	260	0	275
23	Ratnapura	0	0	30	151	181
24	Trincomalee	15	0	30	0	45
25	Vavuniya	15	15	0	0	30
	Total	360	250	1010	602	2222

DEVELOPMENT OF RENEWABLE ENERGY

RE Technology Roadmap

2050+

