

# 100% Renewable Energy Plan of Sri Lanka

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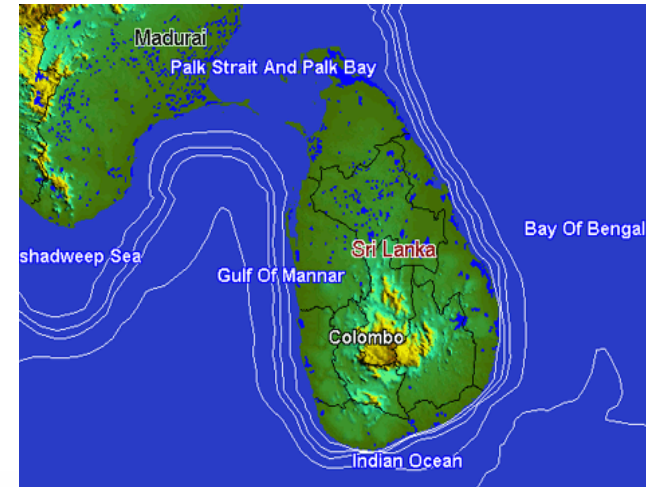
# 1. Country at a Glance

## □ Socio-Economic

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

## □ Energy Sector

- ✓ Primary Energy Supply by Sources:
  - Biomass : 43.3%
  - Petroleum & Coal : 49.8%
  - Large hydro : 4.3%
  - NREs (Small hydro, wind, solar): 2.6%
- ✓ Total Consumption: 8.9 MToE
  - Industry : 25.4 %
  - Transport : 28.8 %
  - Domestic & Commercial : 45.8 %
- ✓ Electricity Sector:
  - Total Installed Capacity : 3900 MW
  - Peak Load : 2200 MW
  - HH electrification : 98% (Grid - 95% + Off-grid - 3%)



### Generation by Source

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

### NRE Capacities

- Small hydro : 290 MW
- Wind : 100 MW
- Solar : 10 MW
- Biomass : 20 MW

# 2. Energy Policy Framework

## □ National Development Policies and Strategies

- ✓ Election Manifesto of New H.E. the President – Section 10: An Energy Secure Sri Lanka
- ✓ Haritha Lanka Programme: Action plan of the National Council for Sustainable Development
- ✓ Provincial Sustainable Energy Policies / Plans (in progress)

## □ Energy Sector Policies and Strategies

- ✓ Sri Lanka Energy Sector Development Plan for a Knowledge-based Economy 2015-2025
- ✓ National Energy Policy and Strategies
- ✓ National targets (20% grid electricity by NRE & 2000 GWh of electricity saving by 2020)
- ✓ Sustainable Energy Policy / 100% RE Policy (draft)

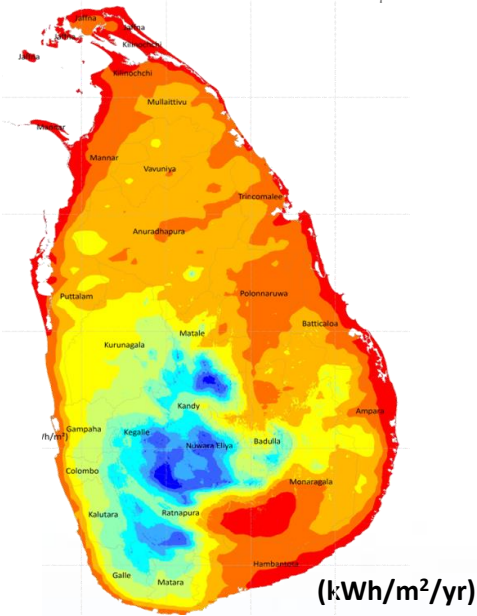
# 3. 100% RE – The Rationale

- Present Context – Unsustainable Scenario
  - ✓ Energy & Transport Sectors heavily Foreign/Petroleum Dependent
  - ✓ Economic Burden in Long-term Context
  - ✓ Resource Depletion / Environmental Concerns
  
- Welcoming Opportunities for Sustainable Scenario
  - ✓ High Resource Potential
  - ✓ Technology Advancements / Competitiveness in RE
    - ✓ Solar PV Prices & Technologies
    - ✓ Storage Systems / Decentralized Systems
  - ✓ Energy Efficient Technologies / Energy Mgt. Systems
  - ✓ Knowledge Management / Sustainable Life Styles
  - ✓ Opening up of Green Financing Avenues

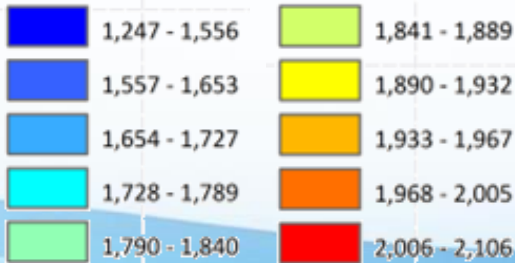


# 4. 100% RE – The Resource Base

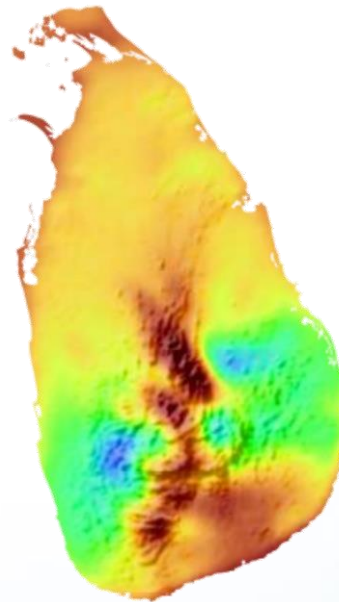
Solar



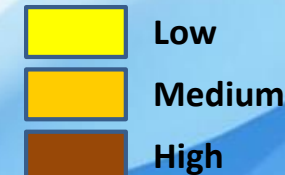
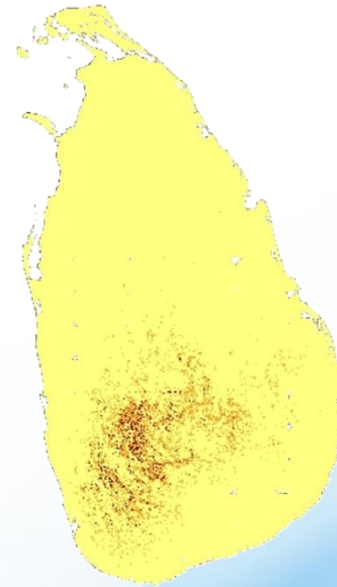
(kWh/m<sup>2</sup>/yr)



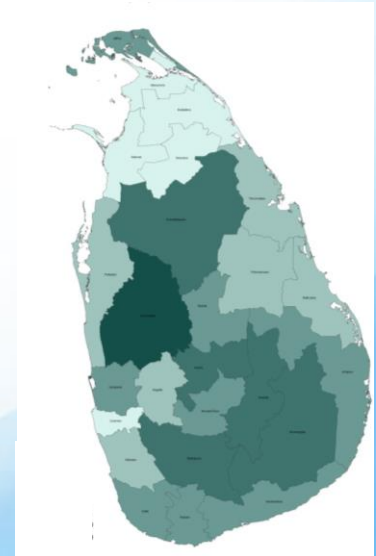
Wind



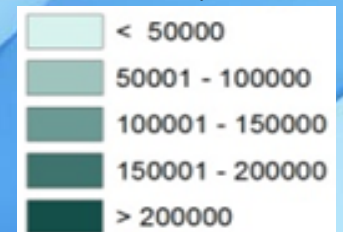
Hydro



Biomass

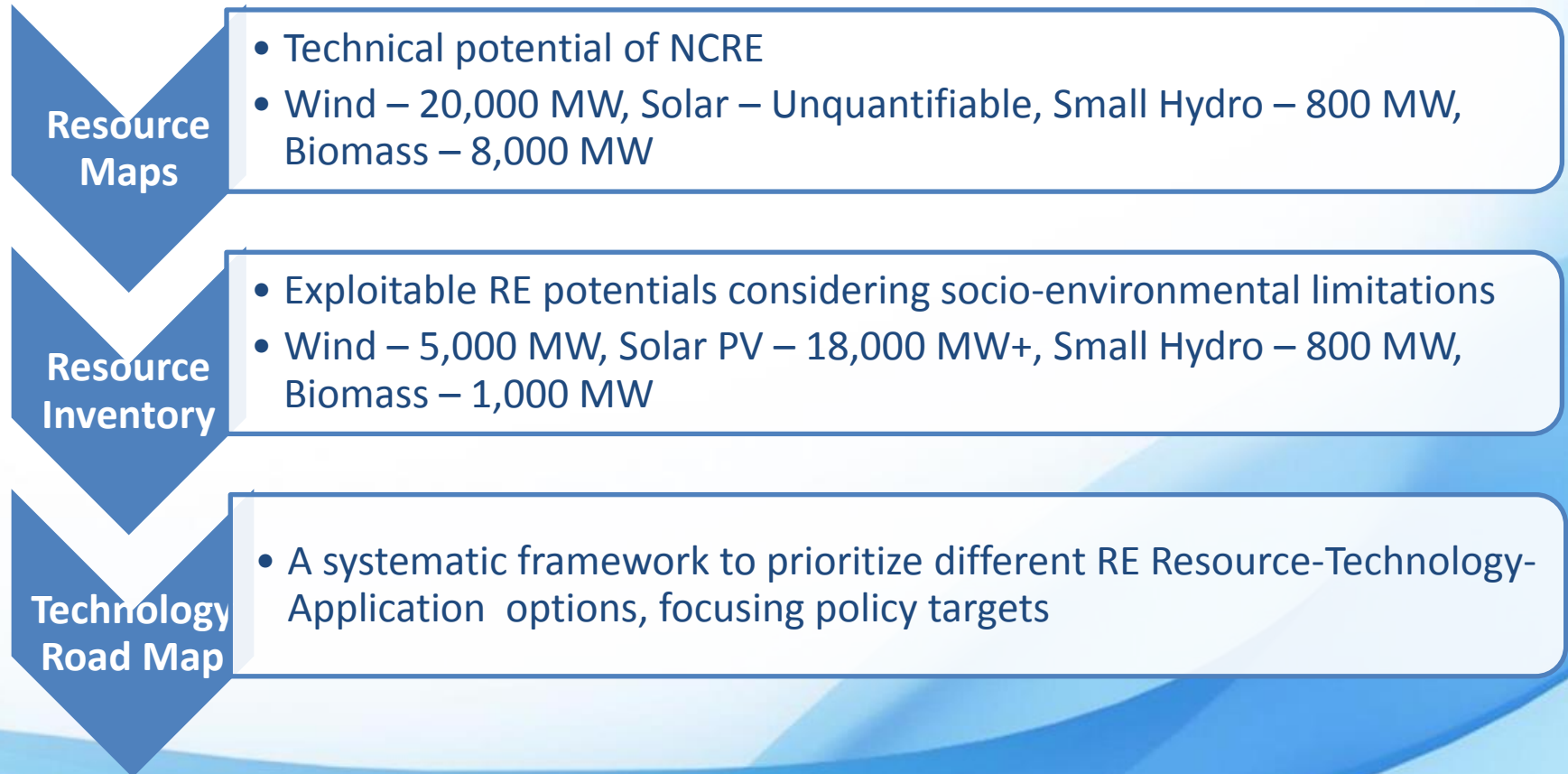


Tons/Annum



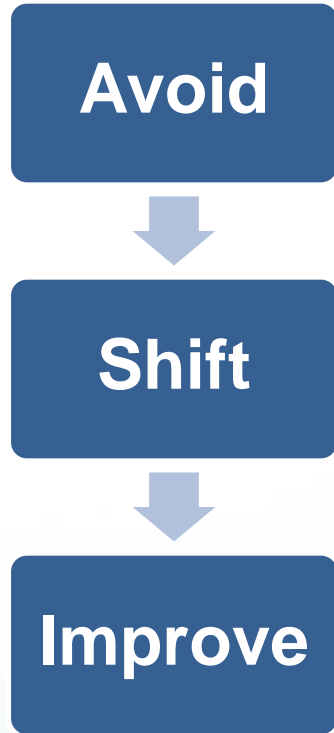
# 4. 100% RE – The Resource Base (Contd.)

## • Strategic Approach

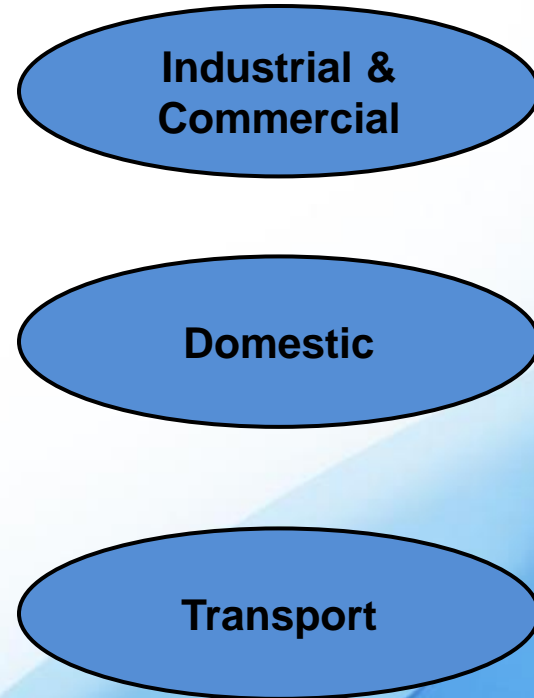


# 5. 100% RE – The Overall Approach

## ✓ Strategic Approach



## ✓ End-use Sectors



**RENEWABLE ENERGY**

# 6. 100% RE – The Energy Use Scenario

- Stable population of around 23 million people, transformed to energy conscious society
- A transformed society
  - ✓ With full digital convergence
  - ✓ Integrated mostly electronically
- 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 ( $\equiv$  10 kWh/person/day)
- 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
  - ✓ Gradual virtual grid isolation using solar and battery storage
  - ✓ Gradual shift for EVs, etc. (around 30 kWh/person/day at fully developed stage)



# 7. Sectoral Approaches

## 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 bio-fuels and compressed biogas powering long haul transport

## RESIDENTIAL

- Almost all homes isolated 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. Sectoral Approaches (Contd.)

### INDUSTRY

- ❑ Industries are resource efficient low energy demand types
- ✓ Thermal energy from improved biomass, biogas and RDF
- ✓ Geothermal, Ocean thermal for low temperature thermal energy
- ✓ Solar water pumping for lift-irrigation
- ✓ 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 - 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**

# 8. Costs/Benefits and Barriers

## □ Economic Impact

- ✓ Direct Cost assuming 100% Solar with 2/3 of energy storage US\$ 150 billion (90% of the cost for storage)
- ✓ 2/3 of GDP under US\$ 10,000 per capita GDP scenario

## □ Co-benefits

- ✓ Employment Creation
- ✓ Value Addition for Local Resources
- ✓ Local Expertise Development

## □ Barriers

- ✓ Multi Stakeholder Involvement
- ✓ Not a Major National Priority (like Poverty Alleviation)
- ✓ Requirement of Coordination through a Sound Institutional Setup

# Summing Up

- ➔ **Towards An Energy Secure Sri Lanka**
- ➔ **Supporting Global 100% Renewable Energy Future**

**Acknowledgements for the organizers of ACEF 2015**

**Thank you !**