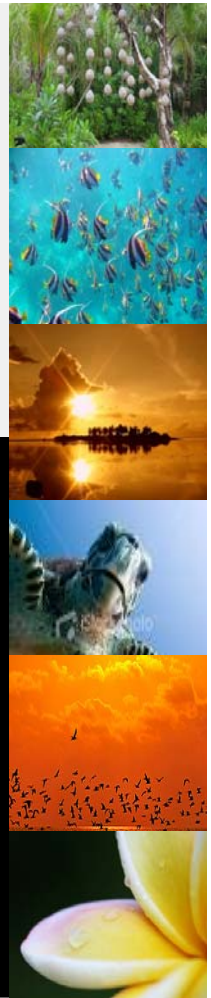


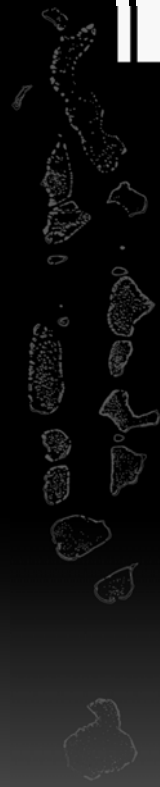
Climate Change and Technology Needs



Republic of Maldives

Geographical Information

- Maldives is a chain of coral atolls stretching 860 km
- 80 to 120 km in width
- Total land area: approximately 300 sq.km
- Contains 26 geographic atolls
- Contains total of 1,192 islands altogether
- Population of 300,000 plus
- Annual growth rate 1.9%



Geographical Information

- Warm humid climate.
- Daily Temp. varies from 26 - 31°C
- Weather dominated by 2 monsoons
- Dry northeast & wet southwest monsoon
- Main economic activities are Tourism and Fishing
- No proven non renewable energy resources



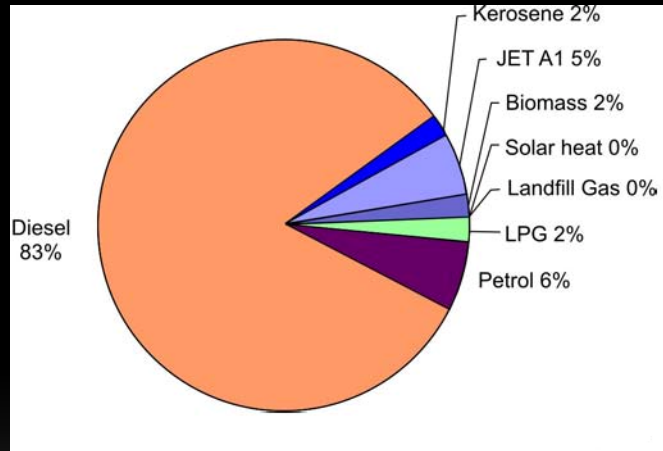
Why is Maldives so vulnerable to Climate Change?

- Extremely low elevation-1.5m above MSL
 - Potential land loss and beach erosion
 - Small size & unconsolidated
 - Human induced vulnerability
- Infrastructure damage and economic impacts
- Food security
- Damage to coral reefs
- Water resources
- Human health



1. Energy Sector

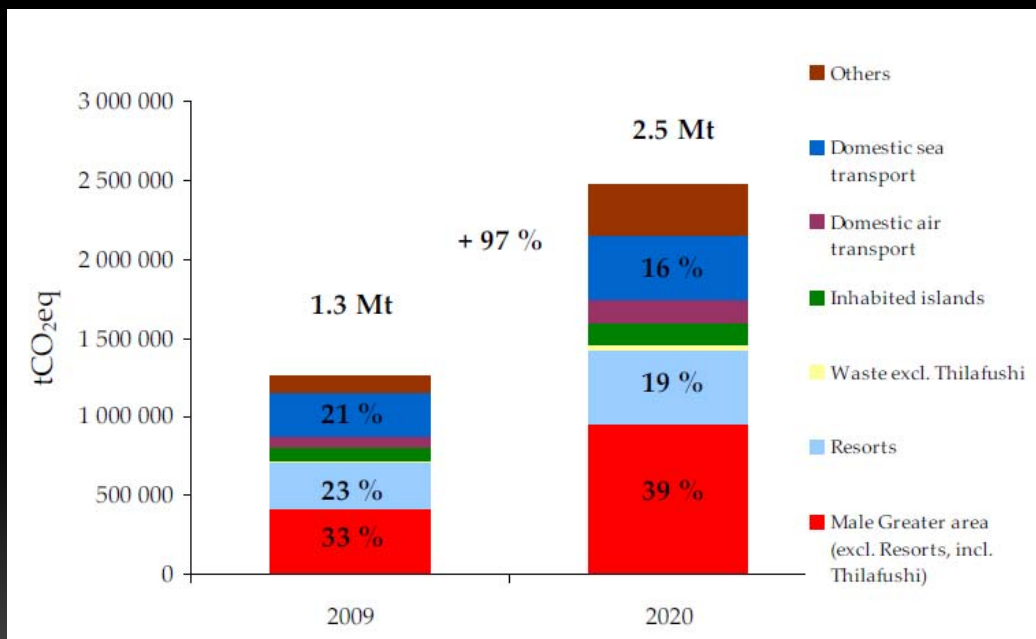
- ❑ Entirely depend on imported fossil fuel in meeting energy demand
- ❑ Fuel import bill is **16%** of GDP equivalent to US\$ 0.24 billion (2010)
- ❑ Total primary energy consumption, 2009 - **340,311 toe**
- ❑ Total GHG emissions in 2009 was **1,030,157** tons of CO₂ equivalent for energy sector
- ❑ Large amount of imported diesel is used for **electricity generation** and **transportation**
- ❑ **122,417 toe** (44%) used for electricity production in 2009



Energy Supply and Demand Survey 2009

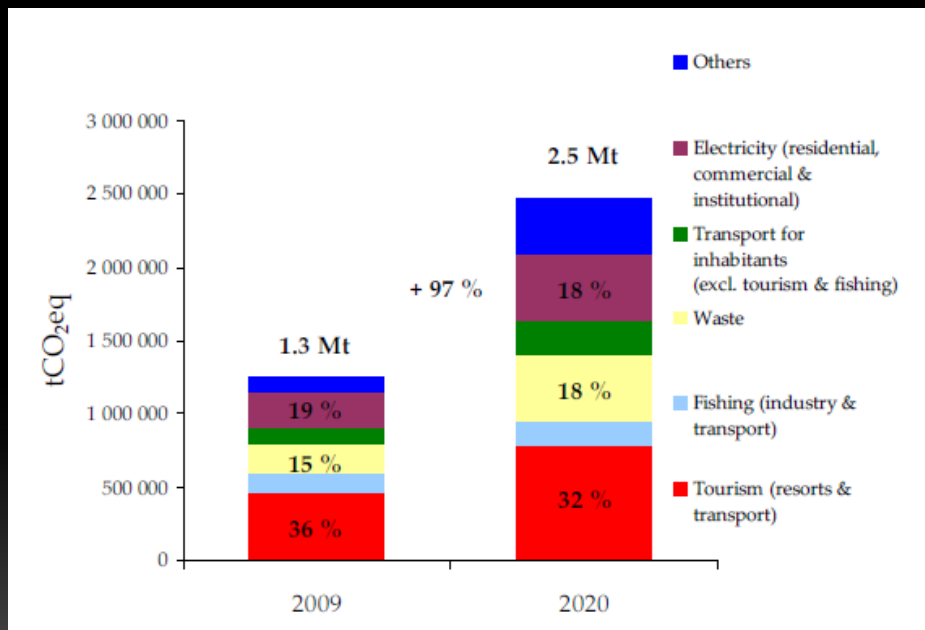
Carbon Audit Report

Emission by geographical sectors



Carbon Audit Report

Emission by economic sectors



Electricity Provision with Renewable Energy Technology

- Maldives is blessed with renewable energy resources, but depends overwhelmingly on petroleum imports for their electricity generation.
- This creates serious economic and financial difficulties and puts the security of energy supply at risk.
- There is a clear potential for using renewable energy sources such as solar energy, wind energy.
- Developing appropriate measures now will secure the constant supply of energy and serve the long term goal of reducing GHG emissions and improving the standard of living of the Maldivians

Potential RE resources in the Maldives

- Solar – 5.2kWh/m²/day
- Wind- 3 to 7m/s

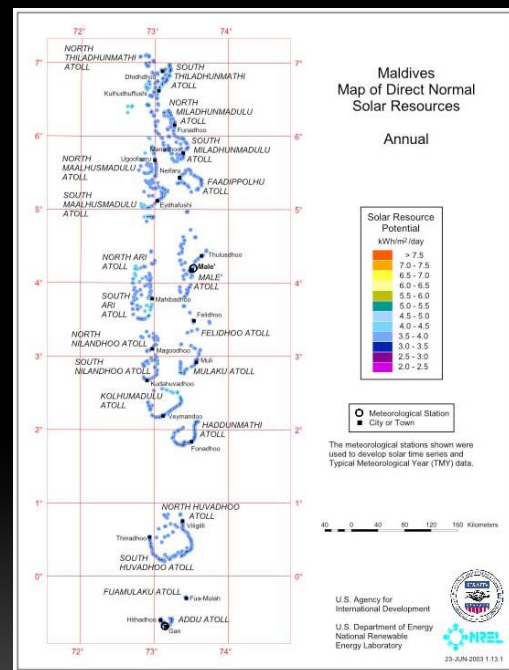
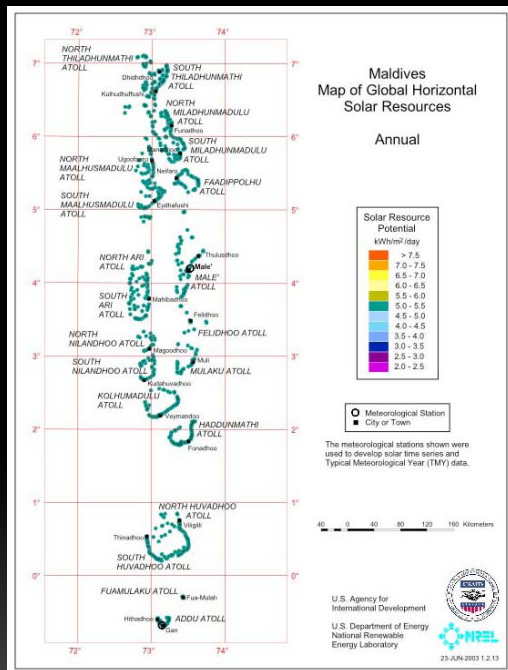


Renewable energy sources tested in the Maldives

Wind energy: *The National Renewable Energy Laboratory (NREL) of United States of America, indicate 3 wind zones on the Maldives, which are South, Middle and North. According to NREL the annual average wind speed in this region is 6.5 to 6.7 m/s measured at 50 m height and the highest annual average wind speed is in the upper middle of the*

Solar Energy: *Solar energy is abundant in the Maldives as it is a tropical country lying at the equator with an average surface temperature of 30-32degree Celsius.*

Solar Energy Potential



A8

Existing technology usage

- Solar PV
 - Power generation (hybrid systems, resorts)
 - Telecommunications
 - Navigation lights
- Solar Thermal
 - Water heating (Resorts and hotels)
- Wind
 - Power generation (pilot systems)

Completed Projects

▪ Adh. Mandhoo (2006) – FIRST HYBRID SYSTEM DEVELOPED IN MALDIVES

- Solar-Diesel Hybrid
- 12.8kWp PV panels + 108kWh battery + 2 x 32kW gensets
- \$180k grant
- Now grid tied and contributes to 50% of island demand

▪ Other Projects in various islands:

- Wind-diesel hybrid systems (with battery)
- Wind-Solar-diesel hybrid systems (with battery)
- Size of systems vary from 5kW to 45 kW

▪ Observations of hybrid systems

- Battery based systems are very costly
- New technologies, but shortage of trained persons, especially in rural islands
- Historically had various problems due to lack of maintenance



Completed Projects



President's Office – 20kW



Thajudeen School– 130kW



STELCO– 45kW



Social Centre– 100kW

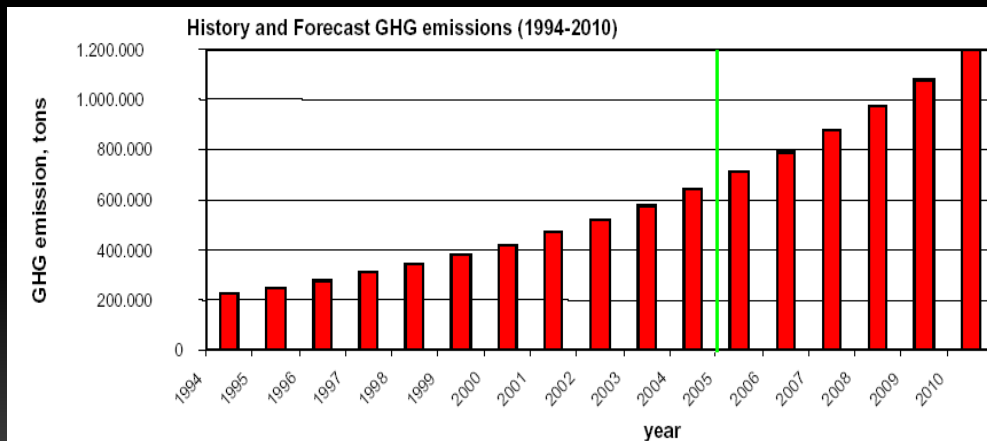


Hiriyaa School – 100kW

2 – Transport sector

- Maldives is heavily dependent on transport sector, due to the geological formation of the country and the spatial distribution of the population.
- Transport is a main contributor to air pollution due to high GHG emitted as a by-product of fossil fuel combustion in transport vehicles and vessels.

- According to the approximation the a major contributor to local air pollution as a significant portion of the GHG emissions in the Maldives is generated by the sector



Source: Mr. Abdul Razzak Idris,

Hard and Soft technologies recommended for reducing Greenhouse Gas Emissions from Transport Sector

- The three fundamental hard and soft technology based transport initiatives to improve air quality to reduce carbon emissions from the transportation sector are:
 - (i) *Traffic Demand Management Techniques*
 - (ii) *Actions to Reduce vehicle and vessel emissions*
 - (iii) *Actions to Reduce Need to Travel*

(i) Traffic Demand Management Techniques

- *Promote technologies for public transport, priority measures and integrated transport systems*
- *Promote technologies for traffic information management systems*

(ii) Actions to Reduce Vehicle and Vessel emissions

- *Promote technologies for use of emissions neutralizers, testing devices of “gross polluters”, and natural barriers converters emissions testing, sensing and screening devices, prevent pollutants dissipation through natural barriers*
- *Promote technologies such as alternative fuel configurations for vehicles*

(iii) Actions to Reduce need to travel

- *Promote public awareness*
- *Promote demand-side management telecommuting to work*
- *Promote institutional strengthening and capacity building*
- *Promote private sector participation in climate change*
- *Promote land-use planning and traffic management schemes*

Policies and strategies

- Second National Environment Action Plan (NEAP II) emphasises climate change and associated sea level rise as a primary concern
- First country to sign the Kyoto Protocol
- Establishment of an Energy Agency, formulation of a National Adaptation Plan of Action
- Undertaking of technology needs assessment and to actively participate in the international forums to advocate special vulnerability of the small island states
- work for the preparation of National Adaptation Plan of Action (NAPA) began in 2004 to explore the feasible adaptation options.

Ongoing Adaptation Measures

- Male' seawall
 - Cost 135 million dollars
- Hulhumale'
 - Elevation of 2m above MSL
 - US\$3,891,050 per sqkm of elevation 2m above MSL
- Resilient Communities
- Coral mining is banned



Mitigation Policy

- Carbon Neutral Nation by 2020
- Investment in renewable energy sources and a cut in net emissions by 100%
- Use of solar, wind and oceanic current energy



Barriers and Challenges

- Lack of financing
 - High capital costs
 - Need better financing mechanism established
 - Govt. subsidy to diesel power generation
- Limited technical capacity
 - Limited manpower to assess, plan, implement , monitor RE technology development and implementation
- Lack of information and essential data of vehicle and vessel usage and emissions levels.

Barriers and Challenges Cont..

- Lack of resource data availability
 - *Only limited data on wind and solar*
 - *Detailed assessment not made on other RE sources such as wave, tidal, OTEC, landfill*
- Lack of public info on RE options (for investors and public)
- Lack of proper regulations
 - *Regulations are now being developed for the energy sector. First power sub-sector will be addressed.*
 - *Transport regulations need to consider emission reduction*

Barriers and Challenges Cont..

- Limited private sector involvement
 - *Lack of awareness*
 - *Limited incentives – Only duty exemption for RE technologies at the moment. Planned to introduce more incentives within the regulatory framework which is being developed.*
- Limited field demonstration of RETs
 - *O&M issues – lacking capacity*
 - *Especially at rural areas*

What's Next ???...

- Long term Adaptation plan
- Mainstreaming the Adaption measures
- Continue Awareness, Training & Education
- Acquisition of technical & financial resources
- Advocate at local, national, regional and international level
- **COMMITMENT from ALL!!!**



Thank You!