

“International Seminar on Energy Security in the Pacific Island Countries”  
- Japan’s Contribution for Optimum Use of Renewable Energy in Island Areas -  
” Energy Security and the Role of Renewables in the PICs”

By Kaoru YAMAGUCHI  
The Institute of Energy Economics, Japan

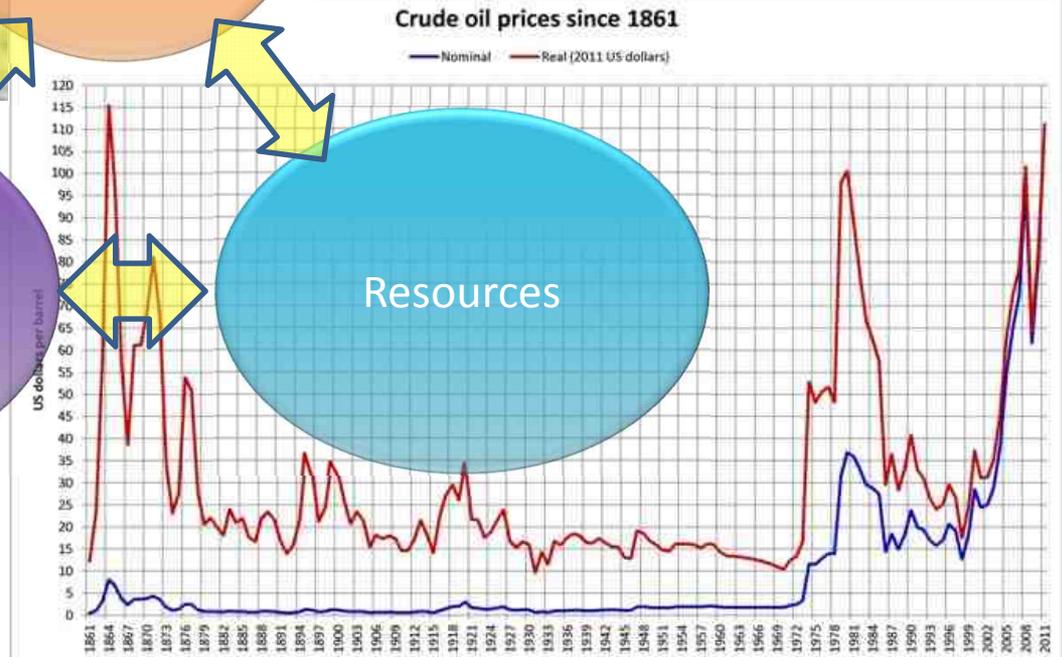
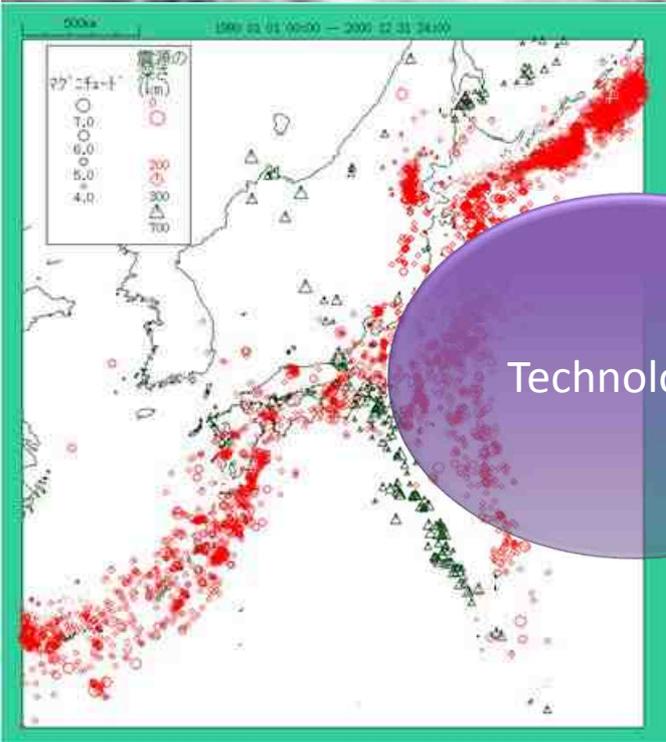
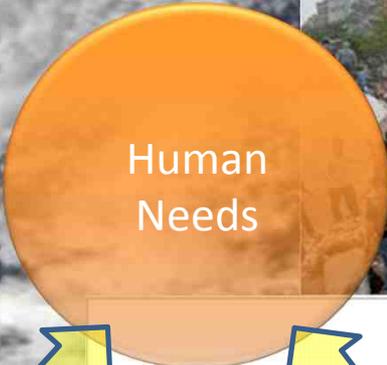
Tokyo, Japan  
June 18, 2015

# Contents

1. Changing Framework
2. Challenges and the Implications to Energy Security of PICs
3. Cooperation and Support

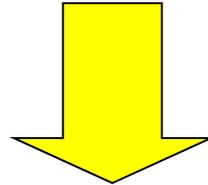
# Changing Framework

# Changing framework (Background): Changing needs, technologies, and resources



# Current Trend: Changing Needs

## Changing Life Style and Energy System of the World

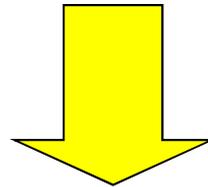


- From Traditional Needs of Biomass to Electricity (Energy Access  $\approx$  Increase of Electrification Rate)
- Increasing modern transportation needs (vessels and cars)

# Current Trend: Resources

## Emerging Constraints of Fossil Fuels

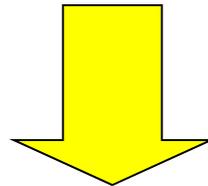
- Regionally biased availability
- Increasing and volatile nature of prices
- Needs to be transported (for PICs)
- Environmental Problems (Global Warming, etc.)



- Increasing Costs and Risk of Fossil Fuels (Mostly oil products in PICs)

# Current Trend: Technology

**Changing Needs and Resource Constraints as a Driver  
("Mother of Invention" in Japanese Proverb)**

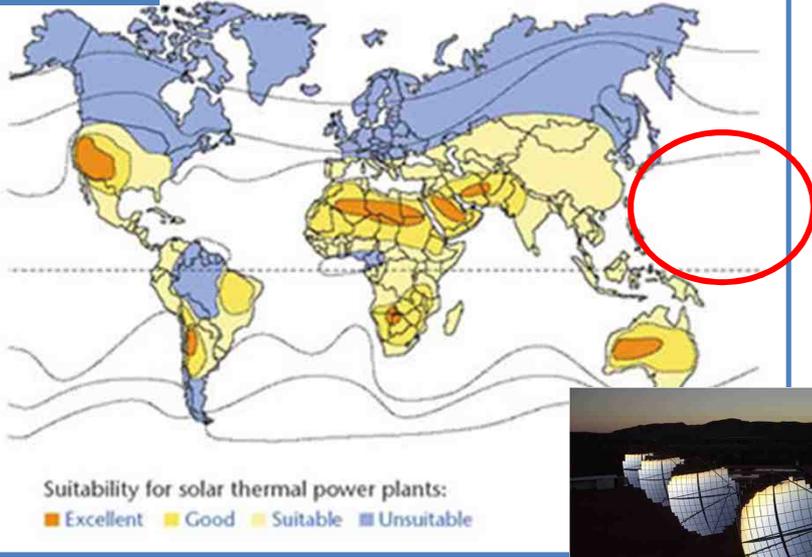


- Increased domestic options of renewables
- Decreasing costs of RE technologies
- Additional Criteria
  - Safety: Resilient to Violent Climate, Natural Disaster, and Accidents/Terrorism
- Advantages of small grids / distributed system for REs

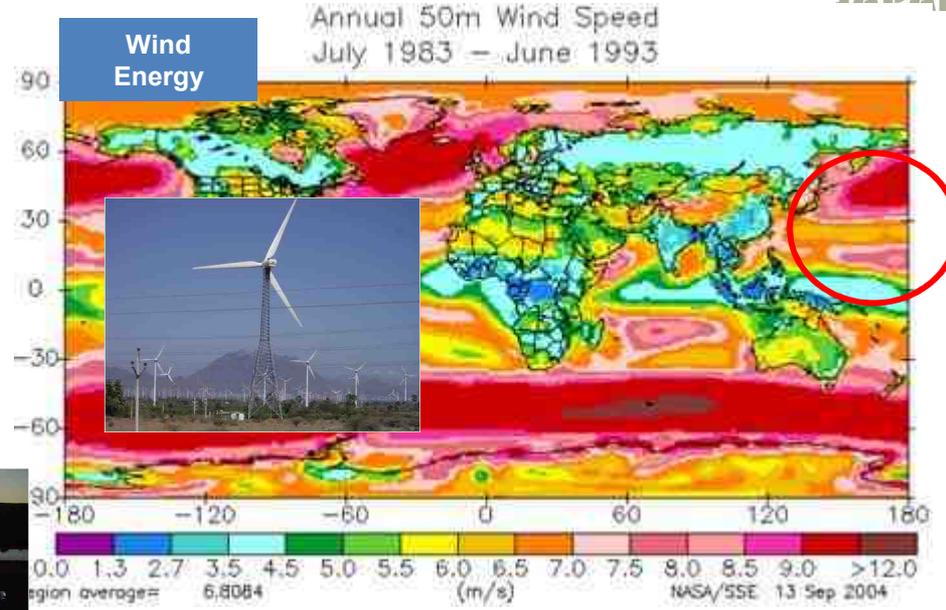
# **Challenges and the Implications to Energy Security in PICs**

# Rich RE Resources in PICs and the Diversity

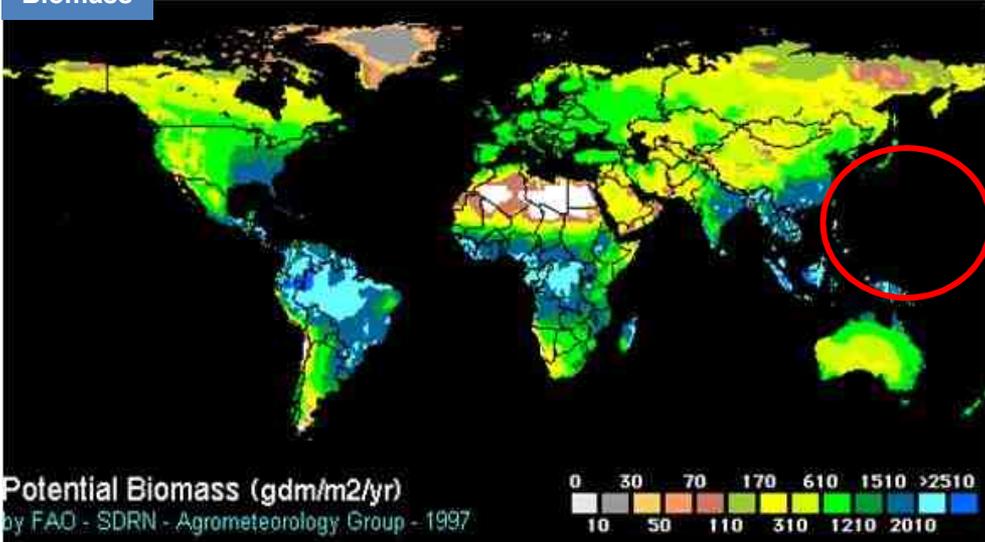
## Solar Energy



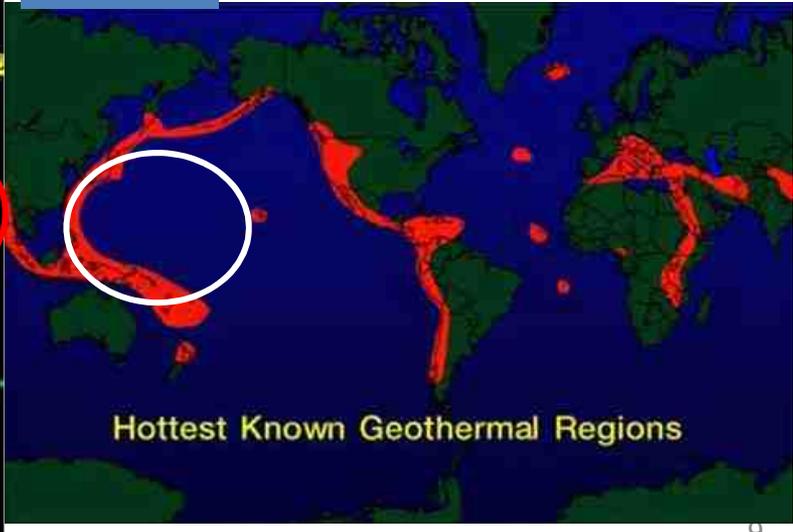
## Wind Energy



## Biomass

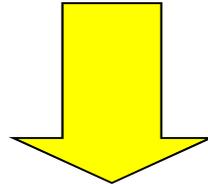


## Geothermal



# Challenges toward the use of RE

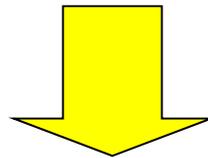
**Intermittent/Variable**  
**Unstable**  
**Distributed**  
**Low Energy Density**  
**Capital Intensive (Low variable cost)**  
**Policy Driven**



**Needs of New Policy and New Technology  
for New Framework of Energy Planning  
(JAPAN'S EXPERIENCE)**

## Japan's Experiences to Promote RE

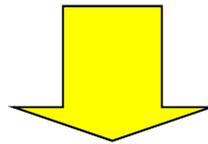
- Increased Use of Various types of Renewables (PV, Wind, Biomass...)
- Hybrid System with Diversified RE Resources
- Add criteria of Safety and Resilience from Natural Disaster and Violent Climate
- Optimize the system (inc. diesel generation)



- Reduce Dependency on Foreign Sources
- Increase Diversity
- Create Resilient Energy System
- Reduce Cost

# FF vs RE: Investment

- **Financial Flow:**
  - **Fossil Fuels: High Variable Cost, but Low Initial Investment >> Advantage in High Discount Rate**
  - **RE: Small Variable Cost, but High Initial Cost >> Advantage in Low Discount Rate**
- **Economy of Scale:**
  - **Fossil Fuels: Advantage for Concentrated Demand with Big System >> Advantage in Big Populated Country**
  - **RE: Advantages in Distributed and Small Systems >> Good for Small Isolated Country**



**Discount Rate: Low vs High**

**Low: Importance of the Future—Long Term Vision (Public Interests)**

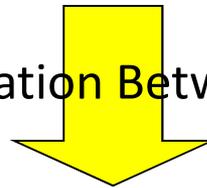
**High: Importance of Now – Short Term Vision (Private Interests)**

# Japan's Possible Support

# Cooperation and Support

- Japan's natural characteristics to share with PICs
  - Same islands in the same pacific
  - Similar RE resources with negligible fossil fuel resources
  - Suffering from nature: Typhoo, Tsunami, Volcanic activities
- Japan's experiences and resources
  - Human resources
  - Technologies
  - Development of business models
  - Long-time cooperation with PICs

Enhanced Cooperation Between Japan and PICs



- Human Resource Development
  - RE technologies and Policy Development
- Possible field of Technology Transfer and Commercial Applications
  - Micro-grid/Smart-grid to enhance energy access
  - Utilization of agricultural resources for energy supply
  - Explore resilient system against violent climate changes