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PROMOTION AND DEVELOPMENT OF RENEWABLE ENERGY AND ENERGY EFFICIENCY IN THE GAMBIA

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Definition of Renewable Energy and Energy Efficiency

- **Renewable Energy:** All forms of energy produced from renewable sources in a sustainable manner, including:
 - **Bioenergy**
 - **Geothermal energy**
 - **Hydropower**
 - **Solar energy**
 - **Wind energy**
 - **Ocean energy** (tidal, wave and ocean thermal energy).
- **Energy Efficiency:** Using less energy to provide the same service
 - 8W CFL replacing 40W incandescent bulb

Why Renewable Energy & Energy Efficiency

- Enhance Energy Security
- Better Environment
- Diversification of Energy Sources
- Enhance energy access
- Make Best Use of Existing Supply Capacities
- Commitments under International Convention (UNFCCC)

History of Renewable Energy in the Gambia

- Promotion of Renewable Energy started over 3 decades ago
- Gambia Renewable Energy Centre (GREC) was set up by a project in early 1980s
- Mandate of GREC was to promote renewable energy and undertake adaptive research in new and renewable energy
- private companies established in 1990s and early 2000 to do renewable energy business, particularly solar energy - supplying home systems and solar water pumping
- No Comprehensive and coordinated program on RE until 2003 when the GoTG approached AfDB to finance a study on RE.
- In 2005, the Cabinet took a decision to waive import duty and sales tax on Renewable Energy Equipment



Renewable Energy Resource Assessment

- Renewable Energy Study
 - GoTG implemented RE Study between 2005 and 2007
 - The Study was conducted by Lahmeyer with grant funding from AfDB.
 - The aim was to assess RE resource potentials of the country and draw up priority projects
 - Preliminary study indicated that the Gambia does possess conspicuous renewable energy potential in **SOLAR, WIND and BIOMASS**

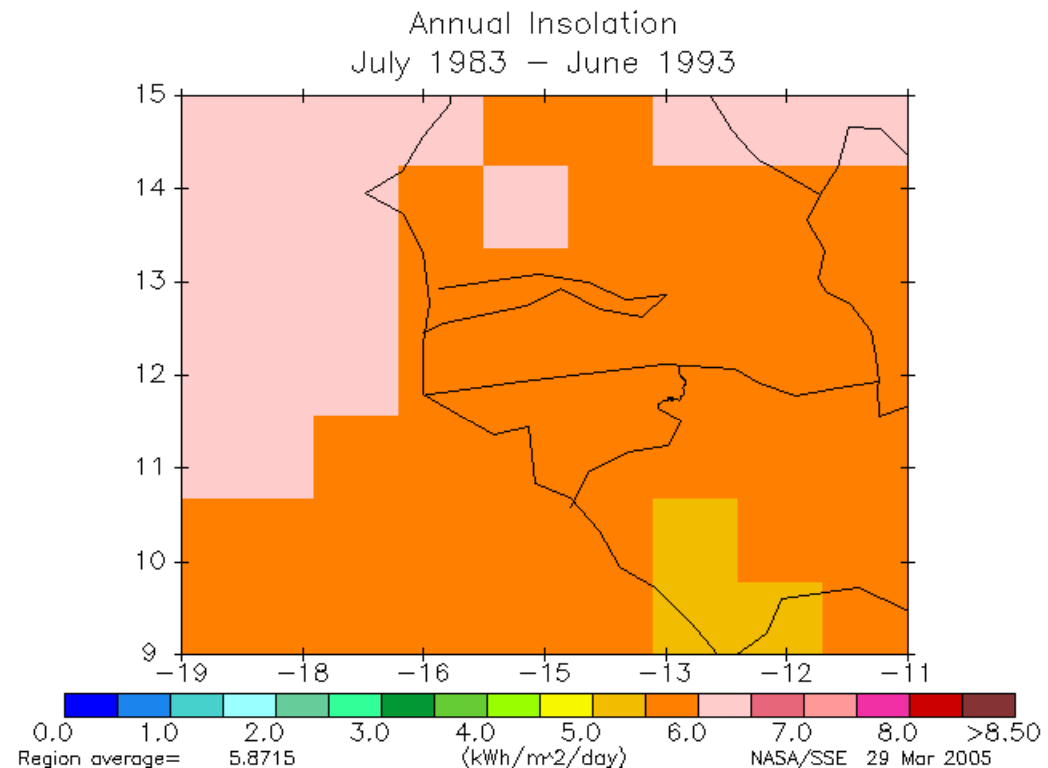
Renewable Energy Resource Assessment

- Renewable Energy Study
 - Solar Energy Potential Assessment
 - Preliminary data collected during RE study showed high radiation values in all regions
 - The average solar radiation over the measuring period ranges from 4500 to 5300 Wh.m⁻².d⁻¹ (without Spring, the most sunny period of the year)
 - Radiation variations over the period was significant
 - Highest radiation happens in February
 - Sept. & Oct. are mths of low radiation because of rains
 - periods of low values are still good for implementation of solar energy program

Renewable Energy Resource Assessment

- Renewable Energy Study
 - Solar Energy Potential Assessment

- The daily solar energy received is on average 5.8 kWh/m^2 equivalent to 21 MJ/m^2



Renewable Energy Resource Assessment

- Renewable Energy Study
 - Solar Energy Potential Assessment
 - Solar: Annual mean values of direct & diffuse solar radiation vary significantly throughout the country as shown in the table below.

Type of radiation and source of Information	Coastal area (13.5 N, 16.5 W) ₁ [kWh/m ² d]	Midland area (13.5 N, 15.5 W) [kWh/m ² d]	Upland area (13 N, 14.5 W) [kWh/m ² d]
Direct (SSE)	5.90	5.21	5.43
Diffuse (SSE)	1.93	2.07	2.04
Total (SSE)	5.93	5.61	5.72
Direct (Meteonorm)	3.23	2.91	2.84
Diffuse (Meteonorm)	2.34	2.38	2.17
Total (Meteonorm)	6.03	5.73	5.42

Renewable Energy Resource Assessment

- Renewable Energy Study
 - Wind Energy Potential Assessment
 - During the RE Study 8 wind measuring stations established
 - At most of the stations the mean wind speed observed for the study period are less than 4m/s at 30m height
 - The mean wind speed of less than 4m/s at 30m height is moderate and limits the use of wind power
 - Along the coast, the observed mean wind speed of above 4.3m/s at 30m height is technically meaningful for wind power development

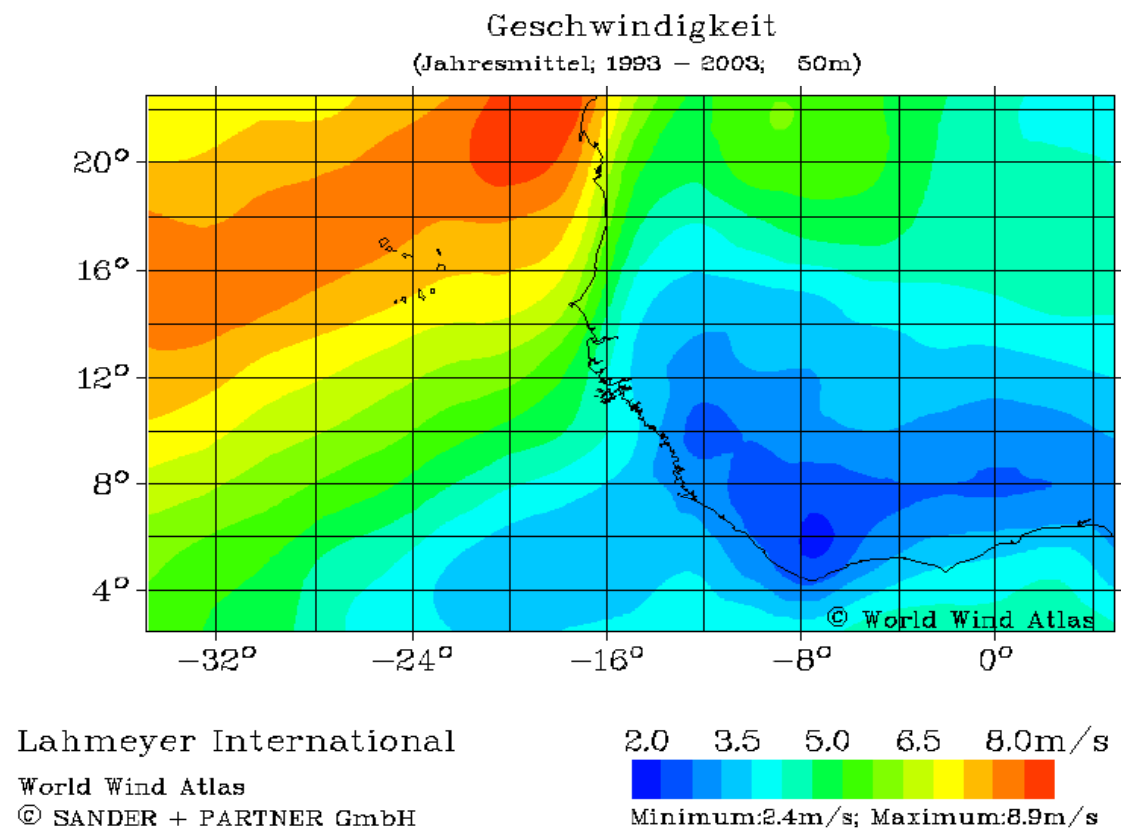
Renewable Energy Resource Assessment

- Renewable Energy Study
 - Wind Energy Potential Assessment
 - Wind energy potential in Gambia can be considered rather moderate
 - At 50m high, the country has an average wind speed of 5.5m/s on the coast and 3m/s inland
 - These figures can be read from the wind map on the next slide

Renewable Energy Resource Assessment

- Renewable Energy Study
 - Wind Energy Potential Assessment

This wind map is from World Wind Atlas, which gives a first overview on the average wind speeds along the west coast of Africa at 50m above the Ground. The Gambia is located right at the centre of the map



Renewable Energy Resource Assessment

- Renewable Energy Study
 - Biomass Energy Potential Assessment
 - Limited amount of biomass resources: wood, agricultural & industrial residues and solid waste
 - In 1997 45% of the area of the country covered by savannah woodland & 1% by close canopy forest.

Renewable Energy Resource Assessment

- Renewable Energy Study
 - Biomass Energy Potential Assessment
 - Energy potential from biomass in the Gambia can be systematically classified into 5 groups depending on the resource origin as follows:
 - Agricultural crop residues
 - Energy crops
 - Animal husbandry residues
 - Municipal waste
 - Industrial waste



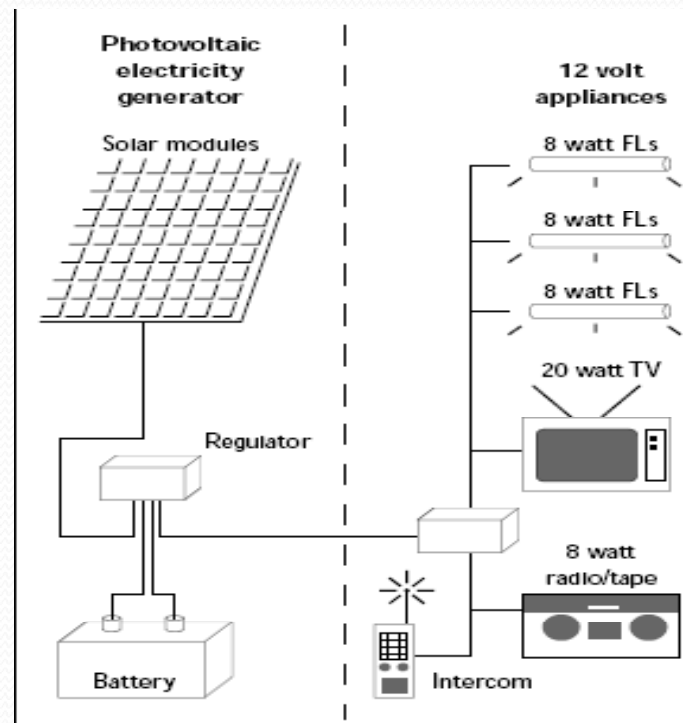
Renewable Energy Resource Assessment

- Renewable Energy Study
 - Priorities
 - Based on the assessment of the renewable energy resources potential, the Government of the Gambia prioritizes the resources for development
 - Solar and Wind Energy Resources are prioritized for immediate development
 - Biomass Energy Resources are prioritized for long term development

Renewable Energy & Energy Efficiency Projects

- Feasibility Study - Solar Home System Program

- Figure showing solar Home system



Renewable Energy & Energy Efficiency Projects

- Feasibility Study - Solar Home System Program
 - 10,000 solar home system program was drawn
 - It is composed of 8 individual project types, including systems for households, schools, health centers & ICT centers
 - The program is estimated to cost **US\$ 7,381,120**
 - The program covers the whole country, particularly those areas without access to electricity
 - The program is also children and women focused

Renewable Energy & Energy Efficiency Projects

- Feasibility Study – Solar Home System Program

Table showing the breakdown of the investment costs for the eight individual Project types

Items	Value (US\$)	# of Units	Total
Solar Home System – 2.5W	70	4,191	293,370
Solar Home System – 40W	650	2,611	1,697,150
Solar Home System – 70W	1,000	2,718	2,718,000
Solar Home System – 150W	2,000	673	1,346,000
Solar Home System – Health Center	10,000	30	300,000
Solar Home System – School (UBS)	6,300	51	321,300
Solar Home System – School (SSS)	55,100	3	165,300
Solar Home System – ICT Center	30,000	18	540,000
TOTAL			7,381,120

Renewable Energy & Energy Efficiency Projects

- Feasibility Study - Small Scale Wind Park

Figure showing Small Scale Wind Park



Renewable Energy & Energy Efficiency Projects

- Feasibility Study - Small Scale Wind Park
 - It is a pilot project
 - It will be located on the coast where the wind speed is high & the electricity grid is present
 - The project will consist of 6 wind turbines of 600kw each
 - The project will have an installed generation capacity of about 4MW
 - Estimated to cost about € 8 million

Renewable Energy & Energy Efficiency Projects

- Implementation of Feasibility Study Reports
 - The priorities of the Gambia Government now is to secure financing to implement the projects recommended by the study
 - The implementation of the priority projects will greatly enhance the development of the renewable energy sub-sector
 - The successful implementation of the projects will improve the livelihood of the rural residents, particularly school children and women and will as well create employment for the youths

Renewable Energy & Energy Efficiency Projects

- Other Renewable Energy Project
 - GEF/UNIDO RE Project
 - Estimated total project cost US\$ 7.6 million
 - Grant Funding of about US\$ 1.7 million from GEF
 - Financing gap of about US\$ 5.9 million to be provided by mix of financing sources – bilateral, multilateral and private sector
 - To be implemented by UNIDO
 - Expected to start this year
 - 5 Components:
 - Demonstration projects of about 1.5MW
 - Scaling up of the investment
 - Legal & Regulatory Framework for RE Sub-sector
 - Institutional Capacity Strengthening
 - Project Management & Coordination

Energy Efficiency & Energy Efficiency Projects

- National Energy Efficiency Program
 - Developed with the assistance from ECOWAS
 - Mainly to substitute incandescent bulbs with Compact Fluorescent Lamps (CFLs)
 - Involved a survey led by Cuban Consultant working for ECOWAS
 - Survey focused on electricity residential customers
 - Estimated 305,000 incandescent bulbs of different watts in residential sector
 - Assuming 7 hrs of daily illumination, if all the residential incandescent bulbs are replaced, 9MW generation capacity is reserved.
 - US\$ 450,000 was estimated to do the program
 - GoTG is seriously looking for funding to implement this program
 - Carried out by MOE in collaboration with NAWEC, PURA & NEA
 - Implementation of the project to start soon.

Energy Efficiency & Energy Efficiency Projects

- Sensitization on Energy Efficiency & Conservation
 - Supported by UNDP under its Environment & Energy sectors support program
 - Printed leaflets, posters and T-shirt for sensitization
 - Conducted nationwide sensitization campaign in late 2009, including TV panel discussion
 - Prepared drama tapes in 4 main local languages and being shown on GRTS
 - Will put up bill boards at strategic locations for more sensitization
 - The program will end this year
 - Carried out by MOE in collaboration with NAWEC, PURA & NEA



Thank you for your
attention