

Introduction to the workshop

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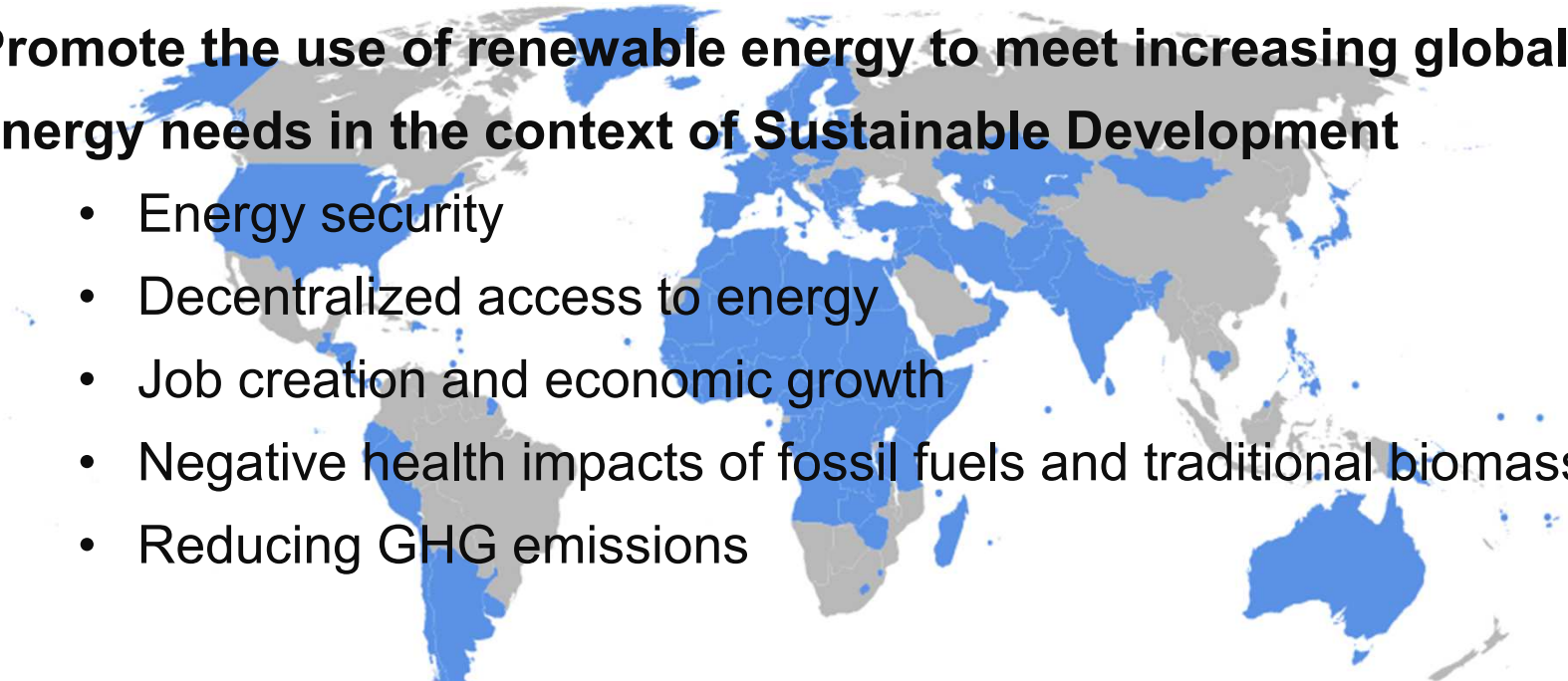
Workshop on Energy Planning

10 December 2012

Abidjan, Cote D'Ivoire

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- **Energy planning approaches**
 - What is the role of energy planning in energy sector development
 - IRENA's modeling approach (mid- to long-term investment planning)
 - Hands-on session
 - **Gap analysis**
 - How to make the methodology more relevant
 - How to establish a relevant process
 - **Roles of IRENA and partners**
 - Training support?/Data support?/Analysis support?/Dialogue support?

Promote the use of renewable energy to meet increasing global energy needs in the context of Sustainable Development

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- Energy security
 - Decentralized access to energy
 - Job creation and economic growth
 - Negative health impacts of fossil fuels and traditional biomass
 - Reducing GHG emissions

Renewable energy sources supported:

Modern biomass, Geothermal, Hydro, Ocean, Solar, Wind

Synthesising knowledge

- Resource potential assessment (global resource mapping)
- Renewable technology cost assessment (Renewable Costing Alliance)
- Technology briefs (with IEA)
- Renewable statistics and indicators (country profiles)

Energy planning

- Economic and technical assessment of renewable technology deployment in an energy system
- Grid stability assessment

Promotion of dialogue for renewable deployment

- Renewable readiness assessment (Mozambique, Senegal)
- Sectoral renewable deployment roadmap (manufacturing sector, building sector, tourism sector, grids and storage)
- UN's Sustainable Energy for All
- Business council



Technology development and transfer

- Technology standardization (with UNIDO and ISO)
- Patent database (with WIPO)
- Project development support
- Promotion of local value chain

Education and training support

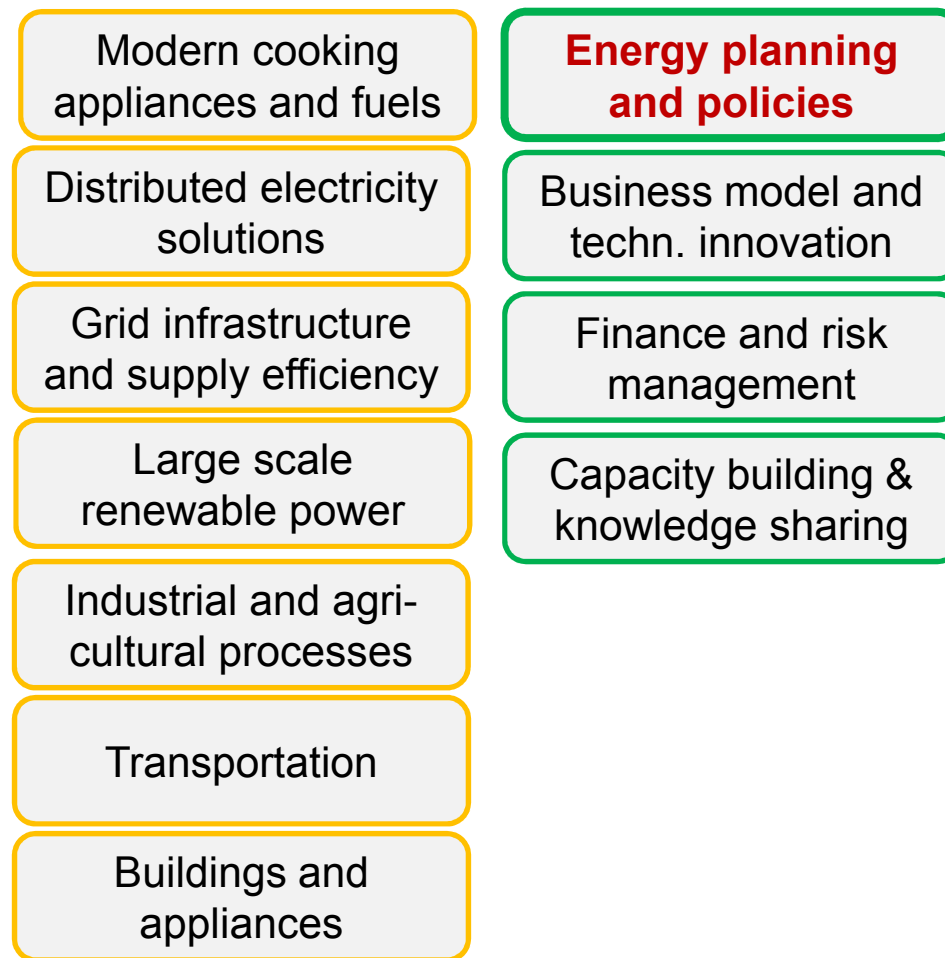
- IRENA Renewable Energy Learning Partnership (IRELP)
- Capacity building agreement with ECREEE

Abu Dhabi Fund for Development

Sustainable Energy for All



IRENA Initiatives – based on the WP



- Methodologies
 - Mid- to long-term investment strategy
 - Grid stability assessment
- Regions
 - Africa, Pacific Islands, Latin America, Caribbean, South East Asia
- Modalities of member states engagement
 - Publications, workshops, training courses, and more

**Global Atlas, Resource fact sheets, Technology briefs,
Sectoral Roadmaps, Renewable Cost Alliance**



Energy system analysis
Least system cost investment planning
Grid stability study (power sector)



**Renewable Readiness Assessment, Project navigator,
Abu Dhabi Fund for Development**

Scenarios and Strategies Project



Scenarios and Strategies for Africa

PRESENTED AT: IRENA-AFRICA HIGH-LEVEL CONSULTATIONS ON PARTNERSHIP ON ACCELERATING RENEWABLE ENERGY UPTAKE FOR SUSTAINABLE DEVELOPMENT



Prospects for the African Power Sector


SCENARIOS AND STRATEGIES FOR AFRICA PROJECT



Renewable resource potential



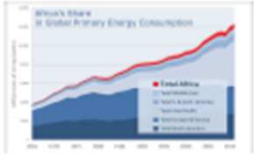
Division of Energy Systems Analysis



Assessing the Renewable Energy Potential of Africa

A GIS based approach taking into account land, water and socio-economic constrains

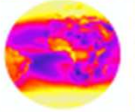
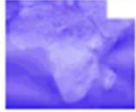
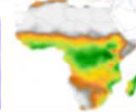

Background
In Africa, the urgent need for higher energy production and increased energy access for the population is overwhelming. On the continent, which is home for 15% of the world population only 2% of global primary energy is consumed, 90% more than 50% of the people live in areas of electricity and about 500 million live in traditional biomass as their main energy source.






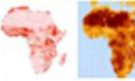



The Research Question
Which amounts of renewable energy sources are available in each country of the African continent?

The Methodology
For our analysis we are using publicly available (open source) geographic data and process them with Geographic Information Systems (GIS) tools. Resource data (such as solar irradiation, wind speed, hydropower potential and biomass potential) are combined with geographical socio-economic data to define application zones for different renewable energy technologies.

The Resources ...

Solar Energy	Wind Power	Bio - Energy	Hydro Power
			
A representation of solar irradiation over the continent. The amount of solar radiation that can be converted into electricity using PV cells.	Energy potential and capacity for the wind resource, and related to climate change, for the continent.	Energy potential and capacity for the biomass resource, for the continent.	Energy potential and capacity for the hydropower resource, for the continent.

Introducing Geographic and Socioeconomic Constrains ...

Forest	Agricultural Land	Protected Areas	Water Scarcity	Altitude & Slope	Population Density	Distance to Cities
						

The Results ...

After combining the Resource and Constrains Maps all areas suitable for renewable energy production are identified on a national basis. In a last step these values are extracted, tabulated and converted into technical potentials.

GIS data

	CSP	PV	Wind
Algeria	1000	1000	1000
Angola	1000	1000	1000
Benin	1000	1000	1000
Burkina Faso	1000	1000	1000
Burundi	1000	1000	1000
Cote d'Ivoire	1000	1000	1000
Egypt	1000	1000	1000
Ethiopia	1000	1000	1000
Ghana	1000	1000	1000
Guinea	1000	1000	1000
Kenya	1000	1000	1000
Madagascar	1000	1000	1000
Mali	1000	1000	1000
Morocco	1000	1000	1000
Mozambique	1000	1000	1000
Niger	1000	1000	1000
Nigeria	1000	1000	1000
Rwanda	1000	1000	1000
Senegal	1000	1000	1000
Sierra Leone	1000	1000	1000
South Africa	1000	1000	1000
Tanzania	1000	1000	1000
Togo	1000	1000	1000
Tunisia	1000	1000	1000
Zambia	1000	1000	1000
Zimbabwe	1000	1000	1000

The report was prepared as part of an ongoing research by the International Renewable Energy Agency and the Department of Energy Systems Analysis at the Royal Institute of Technology (KTH), Sweden. The report aims at contributing to the promotion of renewable energy in Africa. It is intended to be used as a reference for policy-makers and stakeholders in the energy sector. The report is available for free download at www.irena.org.

- **Theoretical potential:** Physical resources (Global atlas)
- **Geographic potential:** Geographic and socio economic constraints (in collaboration with KTH, Sweden)
- **Technical potential:** spacing factors and conversation efficiencies



Scenarios and Strategies for Africa Project

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- Renewable resource potential
 - Cost development
 - A bottom-up technology model
 - Reference energy system
 - Technology parameters
 - Economic optimization
 - Long-terms energy sector development vision
 - Prioritization of investment decision
 - Policy analysis
 - Assessment of financial needs

Opportunities offered by renewable technologies

Power generation in 2008
620 TWh
616 kWh per person



Universal access in 2035
1670 TWh
1100 kWh per person

- Abundant resource potential for grid-connected system
- Cost-competitive off-grid system
- Flexible mini-grid system
- Community development and job creation

Sub-regional power pool modeling – in collaboration with the IAEA’s Planning and Economic Studies Section

- 5 African regional power sector models with all countries modeled individually based on regional power pool master plans/data in public domain
- With IRENA’s data/insights on renewable technology developments and resource potential assessment
- Incorporating the latest methodological development for better assessment of roles of renewables in power systems
- Providing ‘robust’ starting points for further analytical use by interested member states

ECOWAS Renewable energy planning tool (**EREP**)

- Model set up for all the ECOWAS countries using the MESSAGE framework
- MESSAGE training course (starting from scratch): 2 years +
- Energy planning is an continuous process
 - Needs to be updated
 - Needs to be locally owned
 - Needs institutional arrangements

EREP: Prospects for Renewable Power in
the Economic Community of West
African States

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- Presentation of four scenarios for all WAPP countries
- Explores renewable oriented power system outlook
- Investment needs
- Financial needs

Ideas for follow-up

EREP: Prospects for Renewable Power in
the Economic Community of West
African States

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Ideas for keeping it alive and modalities of follow up

- Further model enhancement
- Data update
- Model maintenance
- Model transfer and training
- Further analytical use by member states and partners
- Joint publication with the member states

Day 1

- Energy planning methodologies
- IRENA's EREP (ECOWAS Renewable energy planning tool)
 - Modeling platform (MESSAGE)
 - Model structure and input data
 - Selected results

Discussion

- Role of energy planning in energy sector development
- Validation of IRENA tool (modeling approach, model structure, data, input assumptions, results)
- Usage for policy analysis

Day 2

Demonstration and interactive hands on sessions

- Database structure
- Sensitivity analysis
- Developing alternative scenarios

Agenda

Day 3

- Energy planning practices

Discussion

- Modality of follow up
- Assessment of gaps
- Roles of IRENA and partners
- Areas of collaboration

WWW.IRENA.ORG/PUBLICATIONS

Renewable Energy Technical Potentials

620 TWh generation
150 GW capacity (2010)

Geothermal

88 TWh/yr (7-15 GW)

Wind*

3800 TWh/yr (1750 GW)

Concentrated Solar Power*

6600 TWh/yr (2150 GW)

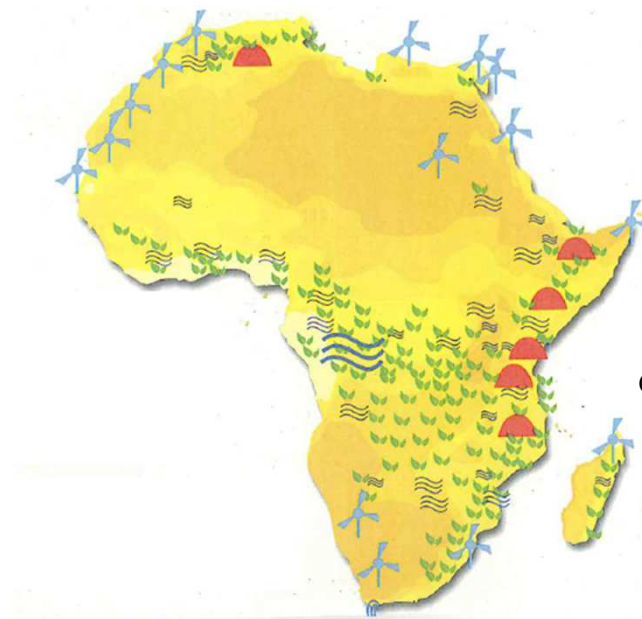
Solar Photovoltaic*

4720 TWh/yr (2700 GW)

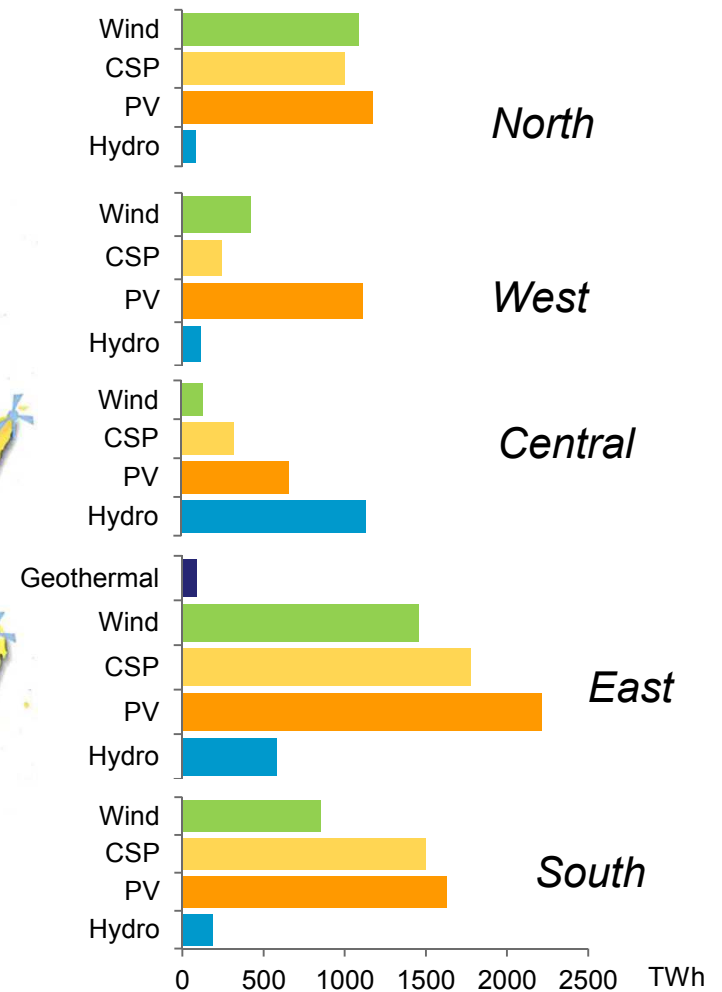
Hydro

1850 TWh/yr (400 GW)

*land availability adjusted



Map: BMU, 2009



Levelised cost of electricity

