Promoting Renewable Energy

Developing the Capacity of ESCWA Member Countries to Address the Water and Energy Nexus for Achieving the SDGs: Regional Policy Tool Kit

October 2016
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Impact of Renewable Energy Nationally and Regionally in ESCWA Region

According to IRENA (during an international meeting in Abu Dhabi in January 2016), countries can deliver on the commitments made in COP21 to keep global temperature increases < 2 degrees Celsius by rapid scaling up of wind and solar power to 36% of the global energy mix by 2030.

This would bring an increase in GDP by ~1.1%, global welfare by 3.7 % and more than 24 million job opportunities in the renewable energy sector.
Title of Section

Prerequisites of adopting alternative energy within the existing energy portfolio

1. Understand how the new portfolio will interface with different energy users and other resources
2. Recognize the impact of the new portfolio on other primary resources of water, land and agriculture
3. Evaluate the role of this new energy portfolio in expanding the distributed energy access to rural areas that the previous centralized energy production system prevented electrification of
4. Set up a renewable energy readiness plan that includes financial, technological, social and policy factors
Framework for achieving national Renewable Energy Targets in the Arab Region
Framework for achieving national Renewable Energy Targets in the Arab Region

Framework

- Working through the barriers to achieving renewable energy targets
- Enabling Policies
- Emerging Technologies
- Regional integration and Infrastructure
- Renewable Energy-Readiness factor and Competiveness Index
Framework for achieving national Renewable Energy Targets in the Arab Region

**Working through the barriers to achieving renewable energy targets**

1. **Local Capacity for research and development**
   - Renewable technologies are linked to specific local conditions
     - This requires national investment in science and technologies (this is lacking in ESCWA region).
   - Few, uncoordinated programs can be found in engineering and science. However, they have not been incorporated into other relevant areas (social sciences etc.)
Framework for achieving national Renewable Energy Targets in the Arab Region

**Working through the barriers to achieving renewable energy targets**

1. Local Capacity for research and development (continued)

   - Training at the supply chain (industry) is needed in order to transition to a more diverse energy mix

   - In the vocational capacity, there is a limited expertise to support the research and development efforts of this sector
Framework for achieving national Renewable Energy Targets in the Arab Region

**Working through the barriers to achieving renewable energy targets**

1. Local Capacity for research and development (continued)

   - To better design a national energy portfolio, expertise and capacity is needed in many areas

   - Developing capacities at civil society level plays an important role in development of renewable energy
Framework for achieving national Renewable Energy Targets in the Arab Region

Working through the barriers to achieving renewable energy targets

1. Local Capacity for research and development (continued)

   - Launching awareness campaigns can:
     • Promote RET in local communities
     • Improve society’s ability to represent their interests in the national renewable energy action plan process
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Working through the barriers to achieving renewable energy targets

2. Culture of innovation
   – Promote development and adaption of new technologies

3. Manufacturing and industries
Enabling Policies

Two elements of public policies:

1. Energy pricing and valuation
2. Energy public awareness and education

There is a strong correlation between energy price and energy use and conservation
Incentives framework is needed for local industries to produce and adopt renewable energies
Emerging Technologies

Two types of solar technologies that have been the focus of development and technological advancement

1. Thermal based technologies
2. Photovoltaic cells that directly generates electricity
Few cautions

– New materials that are resistant to temperature and less vulnerable to dust accumulation are needed

– Co-generation of power and water production is clear way to proceed to make technology more economically feasible
  • Ex: Coupling of water desalination and power generation.

– Typical thermal energy storage using molten salt are being used to store thermal energy during night times when solar generation power is down
Emerging Technologies: Photovoltaic Technologies

Challenges exist from the high temperature and dust concentration prevalent in many ESCWA countries.

Efforts are being focused on new materials and composites:
  – Maintain high efficiencies at high temperatures
  – Self-cleaning surfaces that are robust under high dust

Electric energy storage is of concern.
Battery storage is heavy, bulky and very costly.
Framework for achieving national Renewable Energy Targets in the Arab Region

Framework:
Regional integration and infrastructure

- 3 major regional interconnection grids in the Arab region
  1. Maghreb regional interconnection
  2. EIJLLPST regional network
  3. GCC power interconnection
Framework for achieving national Renewable Energy Targets in the Arab Region

**Framework: Renewable Energy-Readiness factor and Competitiveness Index**

1. **Infrastructure**
   - Natural resources, country overall infrastructure, grid capacity, market infrastructure, electricity access rate and projected demand

2. **Institutions**
   - Public and private institutions related on renewable energy, key policies, access to renewable energy finance, macroeconomic environment.

3. **Human capital**
   - Technical and commercial skills, technology adoption and diffusion and awareness among consumers, investors and decision makers.
Framework for achieving national Renewable Energy Targets in the Arab Region

Global competitiveness scores of the GCC countries

<table>
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<tr>
<th>Global Competitiveness Index (GCI)-pillars</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>KSA</th>
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</table>

Source: WEF, 2011 and Khalifa, 2012
Framework for achieving national Renewable Energy Targets in the Arab Region

The GCC countries’ attractiveness index on renewable energy development pillars

Source: WEF, 2011 and Khalifa, 2012
Main barriers that limit competitiveness

1. Bureaucracy and inefficient institutional structures

2. Lack of policy support

3. Fossil fuel/electricity subsidies
Mapping renewable energy potential in the Arab World

SOLAR MAP OF THE ESCWA REGION

kWh/m²/day

1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

> 5 kWh/m²/day
Framework for achieving national Renewable Energy Targets in the Arab Region

Mapping renewable energy potential in the Arab World

*Renewable Energy Map for the Arab World*
HYDROPOWER : LEBANON CASE STUDY
Hydropower: Lebanon Case Study

Hydropower Potential of Lebanon

Energy Potential of 20 non river sites visited in Lebanon.
Source: CEDRO-UNDP, 2013
Hydropower: Lebanon Case Study

**Challenges and Opportunities of Hydropower potential**

1. In stream hydropower energy resources and non-stream hydropower energy resources

2. Quantification of impact of climate change on hydropower production to fully understand the economic and technical impact is needed
3. Hydropower risks need to be taken into account as nexus tradeoffs
   Nexus tools are ideal to assess these tradeoffs and are described in the “Examining the Water-Energy Nexus” Module
Hydropower: Lebanon Case Study

Lebanon’s attempt to diversify renewable energy sources

The Lebanese Ministry of Energy and Water has expressed interest in developing solar energy, in addition to investing in hydropower.

The Lebanese government, and most ESCWA countries, will have to rely on international and technical assistance.
Framework for achieving national Renewable Energy Targets in the Arab Region

Renewable Energy in the Water Supply Sector

[Diagram of the energy flow in the water supply sector, including source, water pumping, water heating, end-use (agriculture, industry, residential, commercial energy production), wastewater treatment, transpiration/evaporation, and desalination/treatment. Green arrows indicate renewable energy.]

Source: IRENA, 2014.
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Renewable Energy in Water Desalination Processes

Source: IRENA, 2014.
An example of Solar Desalination in Qatar
Solar Desalination in Qatar

**Solar technologies to consider for Qatari conditions**

1. Fresnel Solar collector

2. Parabolic trough + Molten salt storage unit for electricity production (day and night)

3. Dish collector (Sterling motor) for local electricity production

4. Concentrated Photovoltaic collector for electricity production
Solar Desalination in Qatar

Land requirements for solar energy production

1 km² of desert land yields up to 200 - 300 GWh/year
1 km² of desert land equals 50 MW coal or gas plant
1 km² of desert land saves 500,000 bbl of oil/year
1 km² of desert land avoids 200,000 tons CO₂/year
1 km² of desert land can produce 165,000 m³ freshwater/day by desalination


The small to big red squares represent the piece of land you need to cover, in Algeria, with CSP mirrors to generate enough electricity for Germany, for EU-25 (EU union), and the world. Source: Desertec Project.
KEY MESSAGES
Key Messages

1. Growth in renewable energy deployment has to be supported with consideration of the positive and negative impacts on other sectors

2. Renewable technology must be localized and requires more planning and investments in many areas

3. Renewable energy plans should be viewed as integrated solutions between water and energy
4. Renewable energy stimulates the food sector, directly impacts water security and can ease the stresses and potential tradeoffs between water, energy and food sectors.

5. Overall, these dynamics of renewable energy presents both opportunities and challenges for the regional energy, water, land and food resources in the ESCWA region

6. A framework was presented for renewable energy transformation and, specifically a roadmap for MENA countries
Thank you