Challenges and Opportunities in Mainstreaming and Implementing the Water and Energy Nexus: Regional Cases – North Africa

Mainstreaming and Implementing the Water-Energy Nexus for Sustainable Development in the African Region

4-6 September 2018, Addis Ababa, Ethiopia

Rana El-Guindy

RCREEE

Regional Center for Renewable Energy and Energy Efficiency

المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة

RCREEE – Who we are

Intergovernmental Organization with 17 Member States

The technical arm of the League of Arab States (LAS)

A leader in clean energy policy dialogues, strategies, technologies and capacity development

The First Regional Renewable Energy And Energy Efficiency Center Across The World

Secretariat in Cairo, Egypt with regional antennas and a pool of short-term experts

RCREEE's Mission, Vision and Success Factors

*"We, the Regional Center for Renewable Energy and Energy Efficiency, are the strategic partner for the **Arab countries** driving energy transition for the prosperity of all our people."*

(Re)Active

We are connected, accessible and responsive

Variety

Our organizational structure is flexible, multinational and attractive for our stakeholders

Trust

Our partners trust us to contribute to their competitive advantage

Growth

We grow with our assignments

Sustainability

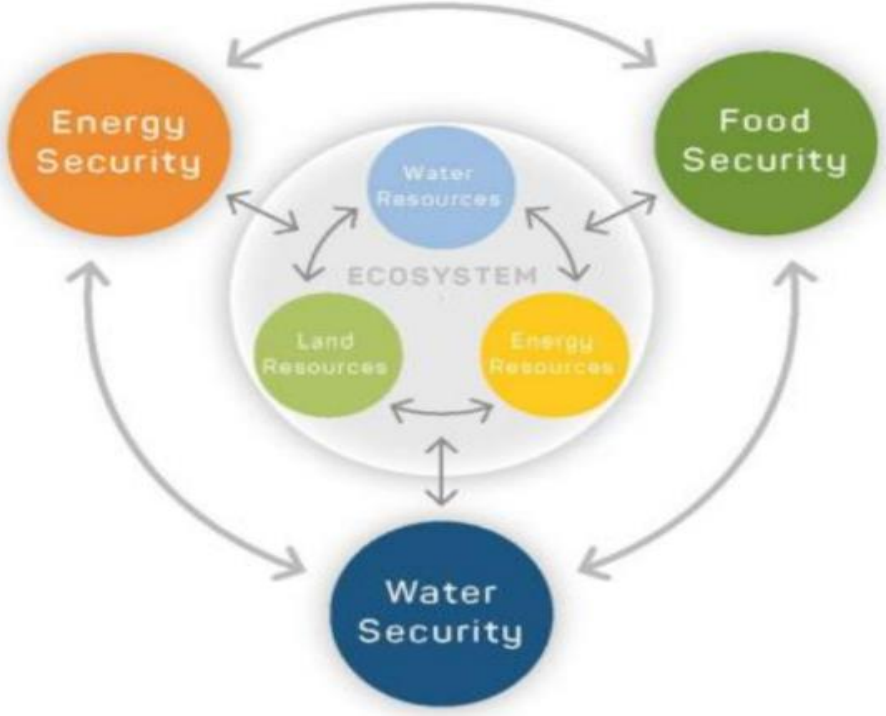
Our business is sustainable

Our Member States

Ever since RCREEE's establishment in 2008 in Cairo, our Member States grew to reach 17 in 2018

Water Energy Nexus status in North Africa

- Water, energy, and food security, are closely interrelated
- Conventional sectoral approaches entail significant trade-offs and negative externalities in other sectors
- Managing and governing water, energy, and land resources requires **coordination** and **cooperation** of the relevant institutions, as well as a **coherent legal and policy framework**



Water Energy Nexus status in North Africa

- Facts and figures about the available resources in Arab countries
  - Represent 10% of world's total surface
  - Host 5% of the worlds' population
  - Only 12 – 14% of surface area is arable
  - Have only 1% of the world's renewable water resources
  - Climate is arid or semi-arid

- Agriculture sector
  - Contributes ~ 5.8% of Arab GDP
  - Employs ~25% of workforce
  - Only 40% of arable area used for agriculture

Water status in North Africa

Country	Total actual renewable water resources (10^9 M^3)	Renewable water resources per capita (M^3) in 2014	Dependency ratio (%)
Algeria	14.3	458	3.6
Egypt	57.3	710.5	96.91
Morocco	29	878.6	0
Tunisia	4.6	419.7	9.101

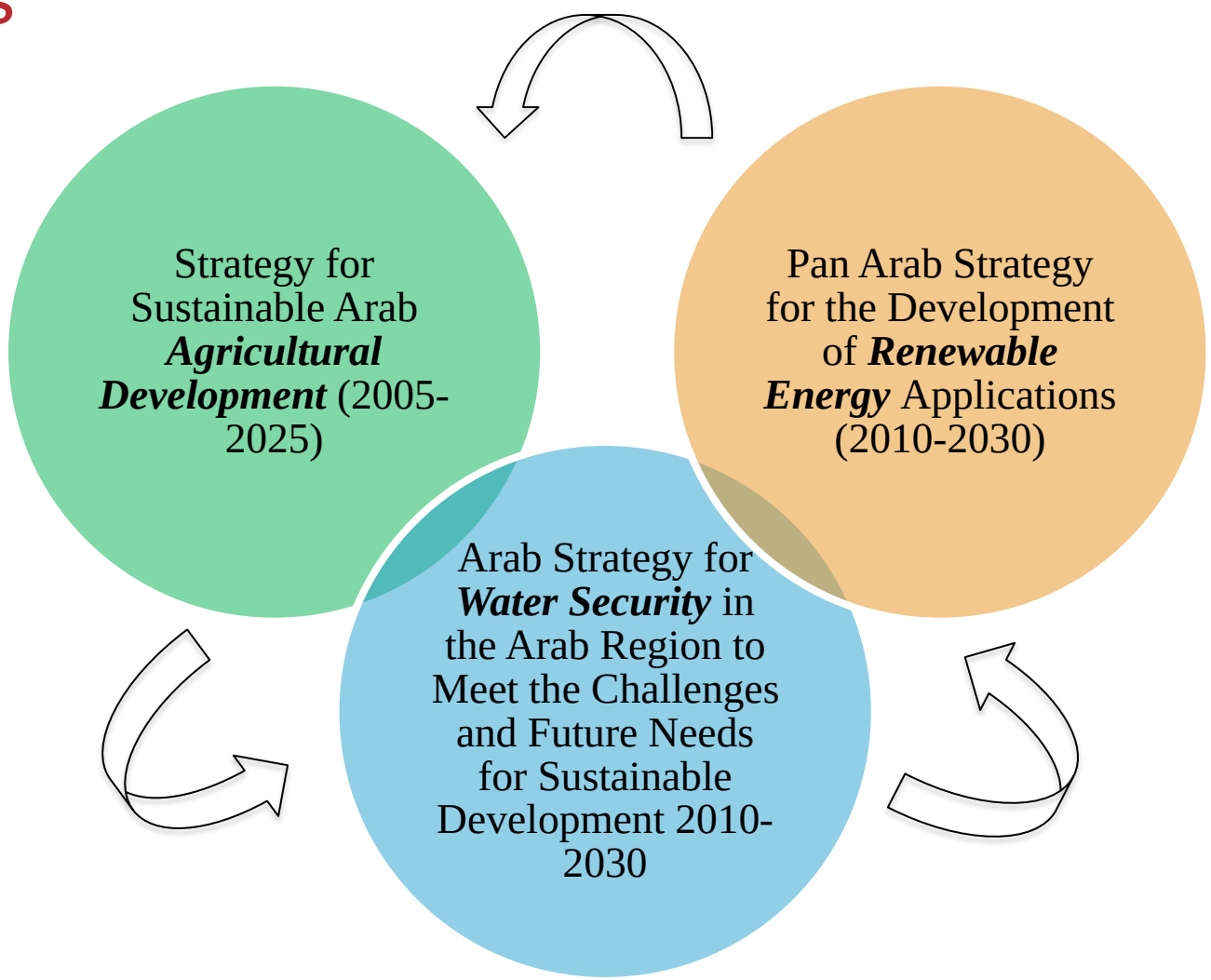
Country	Agriculture % of GDP	Fresh water % withdrawal by agriculture
Algeria	12.7	64
Egypt	14.5	86.38
Morocco	16.6	87.79
Tunisia	8.6	80

Energy status in North Africa

Natural gas is the most important source of energy in North Africa, except for Morocco and Sudan which rely mostly on oil and coal for Morocco

Country	Energy generated per capita (Kwh)	% of population supplied with electricity	TPES (MToE)	Energy intensity (TPES/GDP)
Algeria	1,684	99	54	0.28
Egypt	2,035	99.9	79	0.32
Libya	5,332	98	17	0.5
Morocco	1,077	99	19	0.17
Tunisia	1,671	99.8	11	0.23
Sudan	403	30	16	0.22

Existing sectoral strategies related to the Nexus



Existing sectoral strategies related to the Nexus

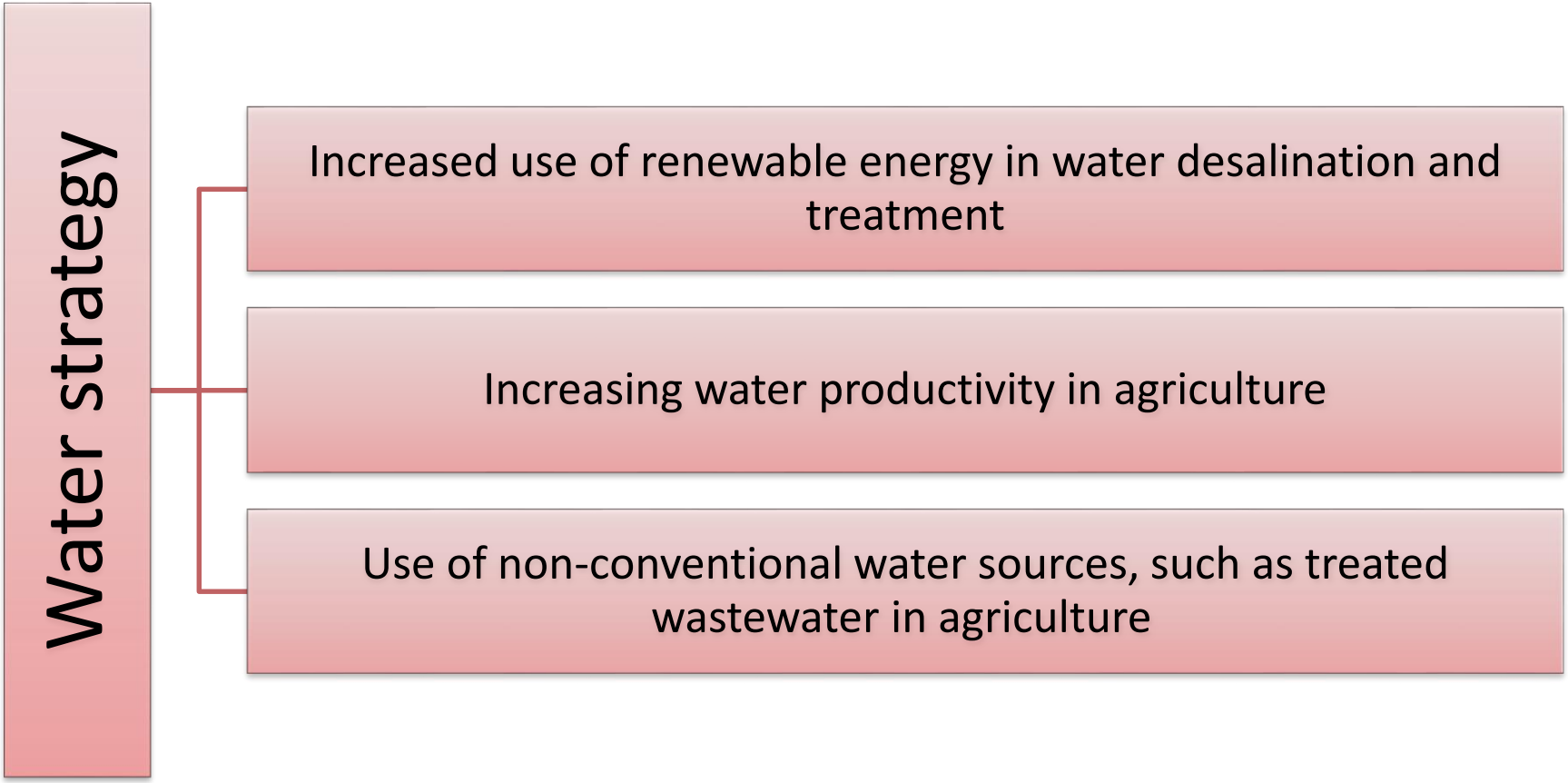
The Arab Strategy for Water Security in the Arab Region

Adopted by the Arab Ministerial Water Council (AMWC) of LAS in 2011. Its main goal is to contribute to sustainable development of the Arab region through:

- Provision of water services for drinking, agriculture and sanitation;
- Application of the principles of integrated water resources management;
- Development of non-conventional water resources;
- Promoting cooperation among countries for the management of shared water resources;
- Promotion of social and individual awareness of water issues

Existing sectoral strategies related to the Nexus

The water strategy recognizes and discusses a number of water energy nexus interlinkages



Existing sectoral strategies related to the Nexus

Strategy for Sustainable Arab Agricultural Development for the Upcoming Two Decades (2005-2025)

- Adopted by the ministers of agriculture in the Arab region and approved through a resolution of the Arab Summit in 2007.

- The agricultural strategy clearly recognizes water as "**the key determinant for sustainable agricultural development** **"** and hence suggests actions for better water management including:

- Improving the efficiency of irrigation systems;
- Development of appropriate techniques for water harvesting;
- Water desalination;
- Water conservation;
- Reuse of treated wastewater and
- Drainage.

Existing sectoral strategies related to the Nexus

Pan Arab Strategy for the Development of Renewable Energy Applications (2010-2030)

- Adopted by the Arab Economic and Social Development Summit in **2013**, mainly aiming to maximize the utilization of renewable energy and the diversification of energy sources to improve energy security.

- In 2017, the strategy was extended by the Arab Ministerial Council of Electricity (AMCE) towards an Arab strategy on sustainable energy complementing it with issues on Energy Efficiency

- The strategy as well as the complemented one highlighted and stressed on the necessity of using Renewable Energies in solar pumping and water desalination

Cross sectoral strategies serving the Water Energy Nexus

2012 — Arab Framework of Action on Climate Change

2015 — Arab Strategic Framework for Sustainable Development

Challenges and opportunities in mainstreaming the water energy nexus

Opportunities in mainstreaming the water energy nexus

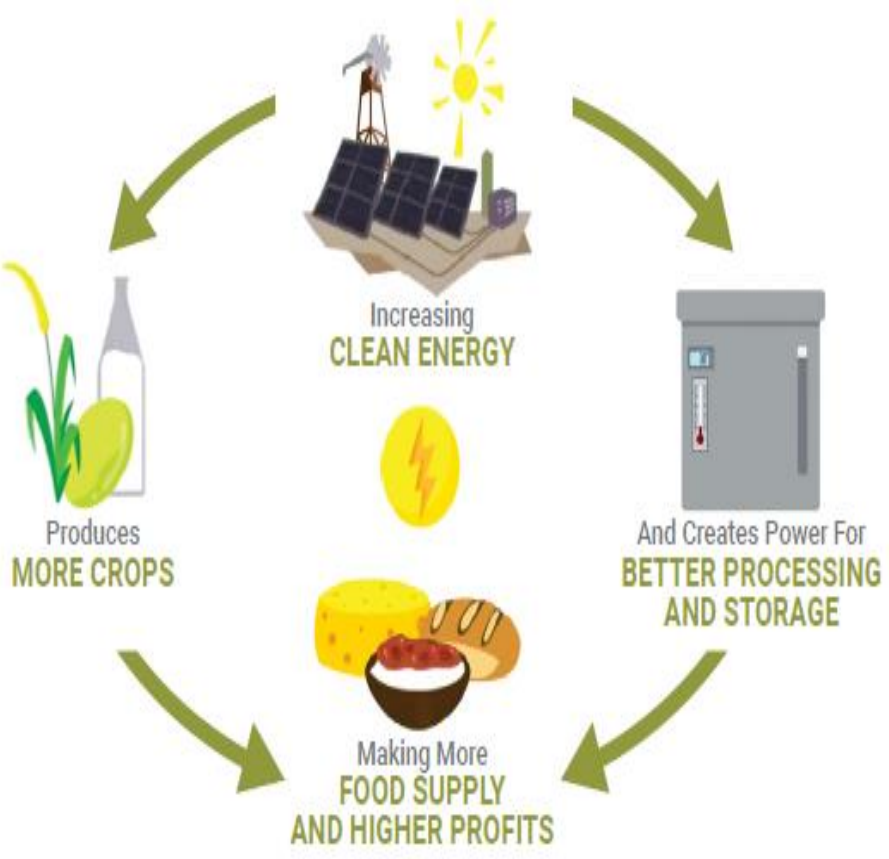
- The regional sectoral and cross-sectoral strategies
- Even if these strategies do not directly mention cross-sectoral interlinkages, their sustainable approaches to sectoral development provide the main opportunities
- Solar water pumping and the use of renewable energy for desalination are the main two topics that are heavily mentioned in all strategies

Solar Pumping Systems – Benefits and opportunities

- Sustainable for irrigation in remote areas
- Longer expected lifetime
- Less cost for operation and maintenance
- Efficient use of energy and water (sustainability)
- Environment friendly, if properly planned
- International prices decrease (Economies of scale)
- Benefits to the governments (no subsidies, no emissions, more food, job creation)
- Growing interest in the Water-Energy-Food NEXUS and Green Funding Facilities.

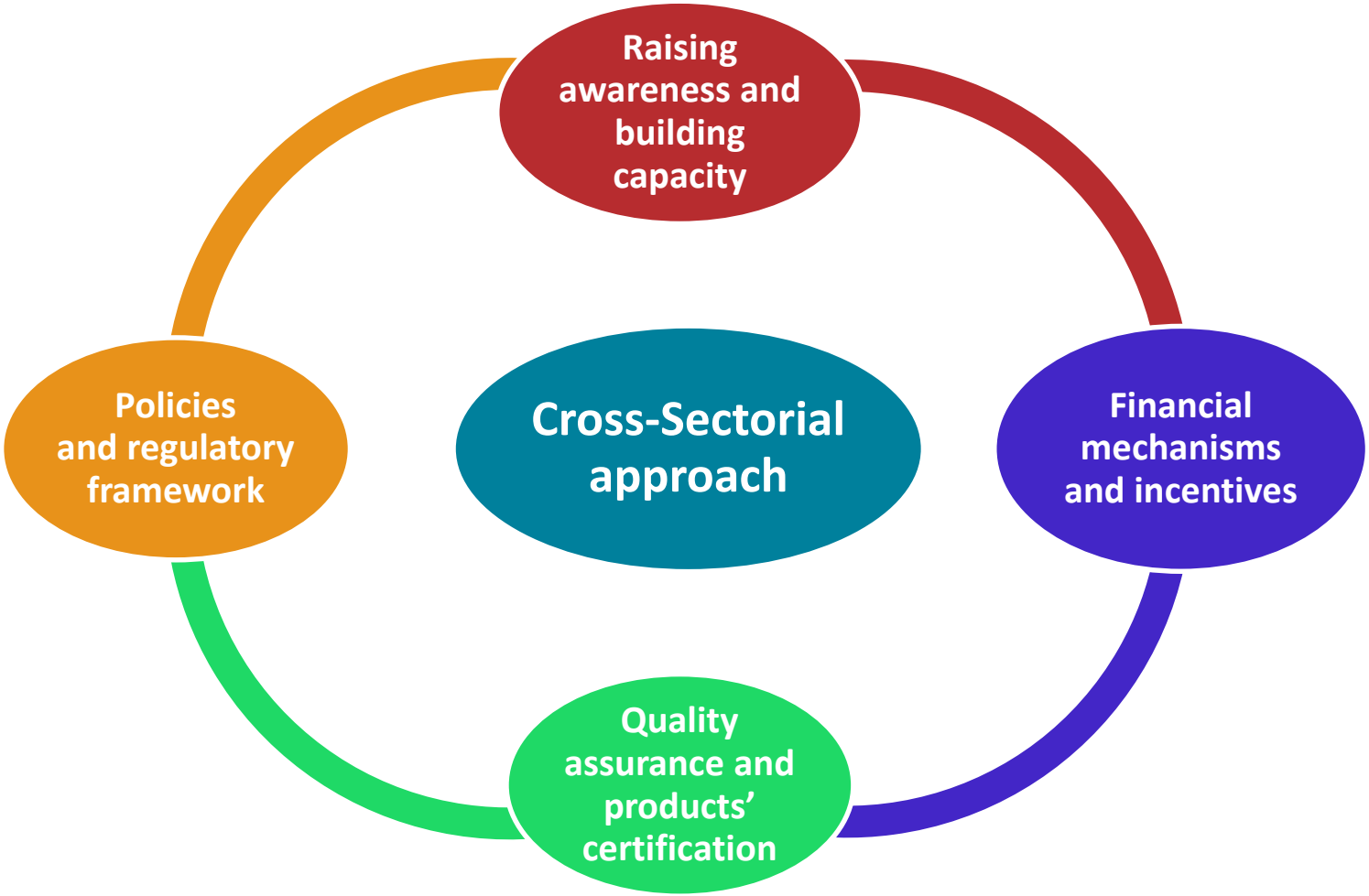
Challenges of Solar Pumping Systems

- Involves more than sector, with different government agencies, no policy champion and coordination mechanism.
- Subsidized alternatives of conventional energy
- Absence of quality assurance measures for systems and installations
- Lack of specialized and skilled labor force
- Lack of visibility and awareness.



[Source: Powering Agriculture]

Essential Components for Sustainable Solar Pumping in the North Africa Region



Good Practices from the Region (1)

Tunisia

Cross-sectorial approach:

- Agreement between ANME and APIA:
  - APIA (Ministry of Agriculture) will promote sustainable energy in the agriculture field
  - ANME (Ministry of Energy) will provide APIA with necessary technical support

Financing mechanism and incentive:

- In agriculture, offering technical support:
  - APIA:
    - subsidy up to 50% (max. TND 500,000)
  - ANME:
    - 40% of CAPEX
    - 70% of CAPEX for complex studies *

Good Practices from the Region (2)

Morocco

Awareness raising:

- Financing guideline for farmers (French & Arabic) *

Capacity building:

- Training course for solar PV installation and solar pumping demos (5-days, 2 levels)

Good Practices from the Region – Regional Approach

Quality assurance

- Credentialing program for training institutions

- For renewable energy and energy efficiency for agriculture
- Services: installations, operations and maintenance

Training certification

- Certified Energy Manager Professional “CEMP”
  - Energy audit
  - Regional acknowledgement
  - of relevance to farming activities especially agri-business

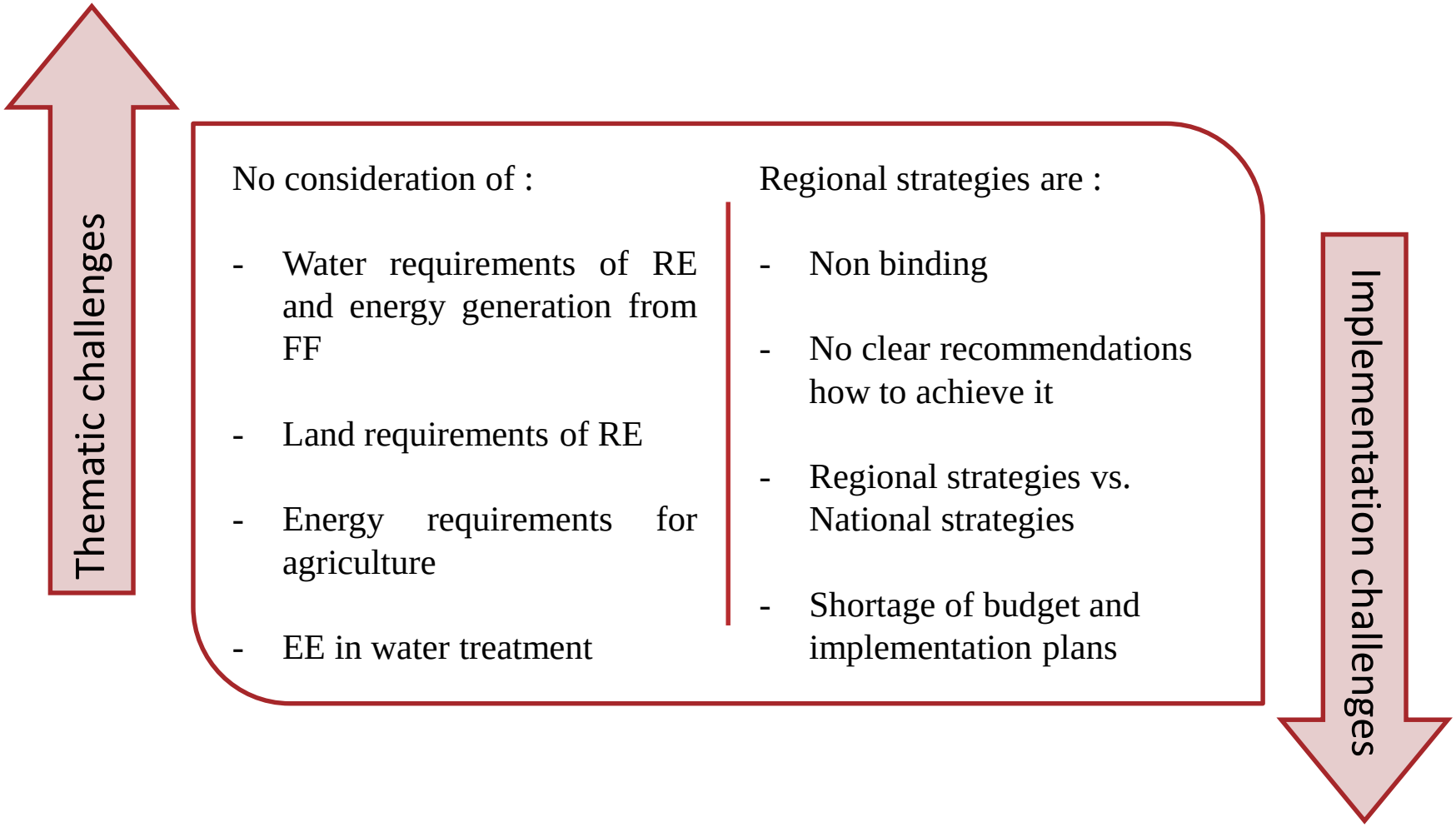
Water desalination using solar power

- The advantage of solar distillation is the simplicity of the process which reflects in the **limited capital requirements** for an installation
- For very small-scale fresh water production, solar desalination is competitive compared to the indirect desalination methods
- Preserve non-renewable underground water
- It can alleviate the pressure from the dams that some countries depends on
- Disadvantages are the relatively **large land area requirements** when it's scaled up and its **low efficiency** per /m^2.

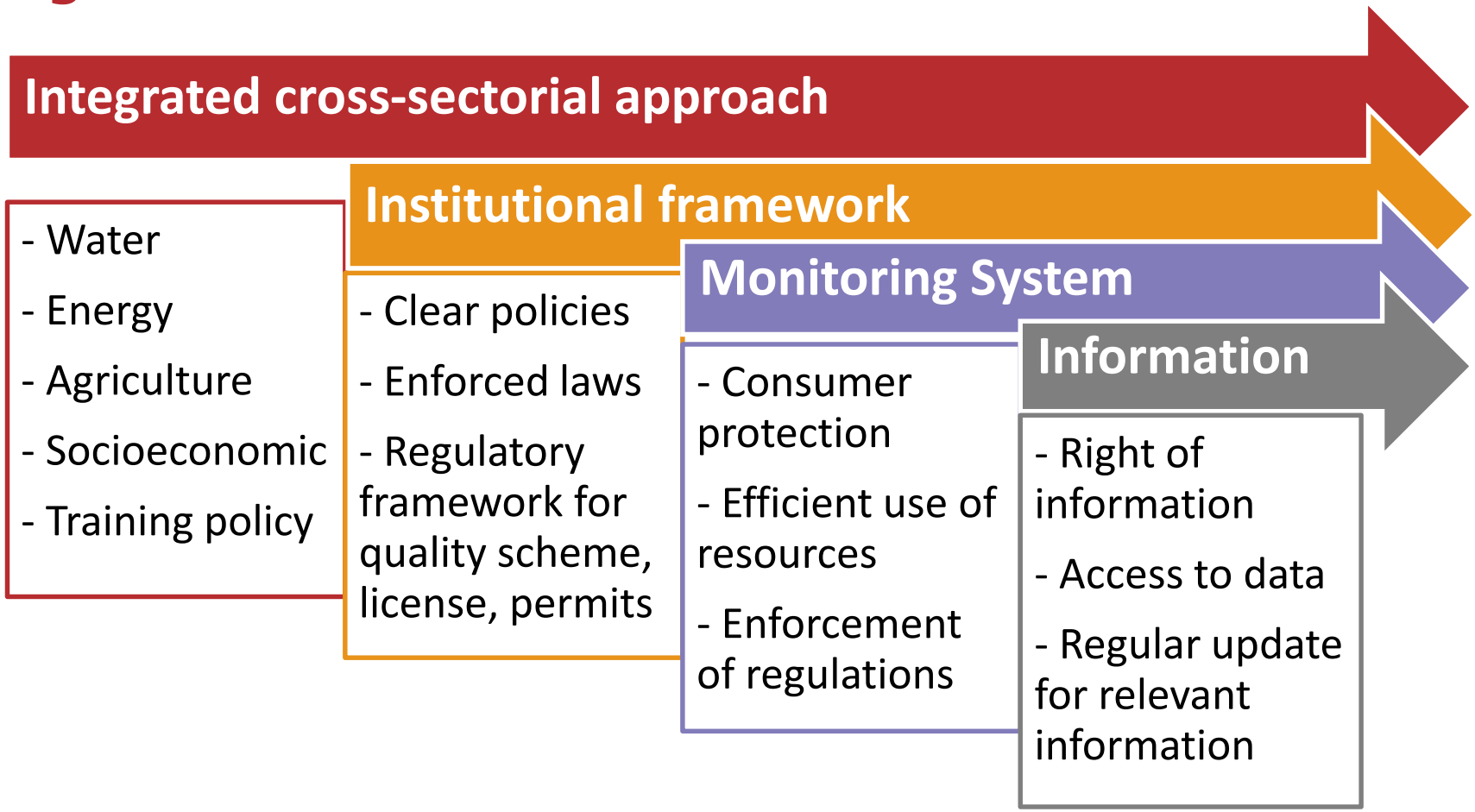
Good Practices from the Region - Morocco

- Late 2017, Morocco announced the launch of the world's largest water desalination plant powered by solar power in Agadir
- Powered by the Noor Ouarzazate solar plant through high-tension wires
- Provide water for irrigation and drinking in the Souss-Massa region
- Alleviate pressure on the region's two major dams, which provide 80% of water needs in the region. Underground water, for its part, represents 20% of water consumed in the region.
- 100% of rural areas in the area of Grand Agadir will have access to desalinated water

Challenges in mainstreaming the water energy nexus



Recommendations for mainstreaming and implementing the Water Energy nexus is the region



RCREEE

Recommendations for mainstreaming the Water Energy nexus is the region

- **Capacity development** is a necessary prerequisite for adopting a nexus approach

- The politics of water and energy must be **anchored in strong political institutions**

- **Institutionalized knowledge sharing**

- Avoid creating new institutions; build on existing institutions and assign clear mandates of responsibility

- Better **coordination** within ministerial councils and countries.

Thank you !

Rana El-Guindy
Senior Specialist – Energy Economist

Regional Center for Renewable Energy and Energy Efficiency (RCREEE)

Hydro Power Building (7th Floor)
Block 11 - Piece 15, Melsa District
Ard El Golf, Nasr City, Cairo, Egypt

Tel: +20 2 2415 4755 ext. (277)
Fax: +20 2 241 54661
Rana.elguindy@rcreee.org
www.rcreee.org

RCREEE