

# Presentation of the synthesis of the mapping exercise in Jordan and Tunisia

**ESCWA UNDA Closing Webinar:  
Presentation of the outcomes of the UN Development Account Project on  
“Up-scaling Energy Efficiency in the residential and services sectors in  
the Arab Region”**

Online, via Zoom, 20 & 21 December 2021



MINISTRY OF ENERGY AND MINERAL RESOURCES  
THE HASHEMITE KINGDOM OF JORDAN



UNITED NATIONS

الاستثمار  
ESCWA

Shared Prosperity Dignified Life

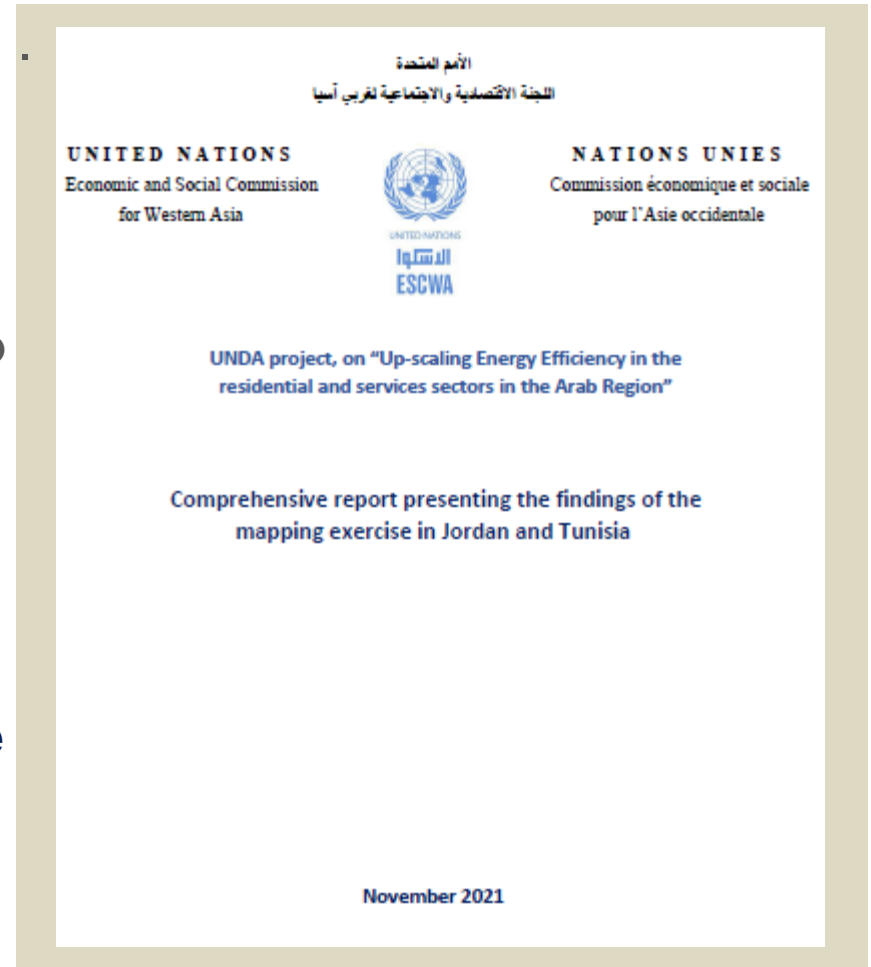


**Adel Mourtada,**  
([adel.mourtada@yahoo.fr](mailto:adel.mourtada@yahoo.fr))  
ESCWA International Consultant  
Senior EE Specialist

# Foreword

This comprehensive report, is composed of the combination of two reports, one for each country (Jordan and Tunisia), presenting the findings of the mapping exercise in each of the two selected countries. These reports are based on the material produced by the national teams and constitute the basis for the remaining activities.

**This report will also help in defining the main axis and players for conducting the EE actions in the building sector.**



# Content of the presentation

---

1. **Methodology of the baseline mapping study of the energy use situation in the buildings sector**
2. **Data collection and analysis methodology**
3. **Findings on the buildings energy issues, policy and institutional frameworks in Jordan and in Tunisia**
4. **International experience on the refurbishment of existing buildings**
5. **Conclusion & Recommendations**

# 1. Methodology of the baseline mapping study of the energy use situation in the buildings sector

---

The comprehensive baseline mapping includes the following:

- Identification of key stakeholders in the residential and tertiary sectors.
- Current state of energy consumption in the residential and tertiary sectors.
- Socio-economic / energy characterization of the existing building stock, by branch of activity.
- Review of existing EE programs and policies, knowhow and capacities in the country, as well as potential local financing tools.

# 1. Methodology of the baseline mapping study of the energy use situation in the buildings sector

---

- **Assessment of the energy pricing tariffs that are in place.**
- **Comparative review of existing energy policies and strategies best practices in selected countries.**
- **Assessment of energy efficiency potential in the residential and tertiary sectors by industry and type of building.**

**The outputs of this mapping exercise will help in defining the main axis and players for conducting the EE actions in the building sector.**

## 2 . Data collection and analysis methodology

---

- **Estimation of the built stock in number and surface area**
  - ✓ by type of building
  - ✓ by geographical and climatic zones
  - ✓ by thermal quality (if possible)
- **Estimation of final energy consumption**
  - ✓ by energy source
  - ✓ by use
  - ✓ By climate zone
- **Estimation of the equipment rate**
  - ✓ By use
  - ✓ by type of building
  - ✓ by climate zone

- **Residential**
- **Office**
- **Commerce**
- **Tourism**
- **Health**
- **Education**
- **Other Tertiary**

## 2 . Data collection and analysis methodology

---

- **Zoom on some specific uses**
    - ✓ Evolution of the equipment rate
    - ✓ Evolution of energy performance
    - ✓ Evolution of energy consumption linked to use
  - **Development of EE Indicators**
    - ✓ By total final energy consumption
    - ✓ By energy source
    - ✓ By use
    - ✓ by type of Building
    - ✓ by climate zone
  - **To allow the development of building stock evolution scenarios and the estimation of EE potential for each park.**
- **Residential**
  - **Office**
  - **Commerce**
  - **Tourism**
  - **Health**
  - **Education**
  - **Other Tertiary**

## 2 . Data collection and analysis methodology

- 4 types of possible sources of information
  - ✓ Sources of public institutions
  - ✓ surveys
  - ✓ Measurements campaigns
  - ✓ Modeling
- It is often necessary to combine certain sources to form complete sets of indicators

Statistical data of the park	Data for GIS	Energy consumption
<ul style="list-style-type: none"><li>• Ministry of Energy</li><li>• Department of Statistics</li><li>• .....</li></ul>	<ul style="list-style-type: none"><li>• Google Map.....</li></ul>	<ul style="list-style-type: none"><li>• Ministry of Energy</li><li>• .....</li></ul>



**Typology & Quantities of Equipment/ Buildings**



**Breakdown by climate zone**



**Characterization physical / energetic**



## 2. Data collection and analysis methodology for the residential sector

---

- **Assessment of information contained in available sources**
- **Methods for estimating additional data (combination of bottom-up and top-down approaches)**
  - **Ascending: use of micro data (Energy consumption of a representative sample of dwellings by type or category of tertiary buildings and climatic zone)**
  - **Descendant: Macro Data (Country or region) according to distribution of buildings categories, population, etc.**
- **Confrontation of results from modeling with metered data (Consumption of electricity/ gas by a representative building stock)**
- **Seeking coherence with national and regional level statistics**

# **Example : Data collection and analysis methodology for the residential sector**

---

- **Main energy services / uses**
  - ✓ Lighting
  - ✓ Heating
  - ✓ Air conditioner
  - ✓ Hot water
  - ✓ refrigerators
  - ✓ Washing machines (dresses / dishes)
  - ✓ Iron
  - ✓ Other
  
- **Other distribution keys according to**
  - ✓ Type and size of housing
  - ✓ Urban / rural
  - ✓ Owners / Tenants
  - ✓ Heating systems installed
  - ✓ Installed air conditioning systems
  - ✓ Thermal quality

# **Example :** Data collection and analysis methodology for the residential sector

---

- **Evolution of the park and equipment rate**
  - ✓ Evolution of the size of the park / thermal quality
  - ✓ Evolution of equipment rate and energy performance
  - ✓ Evolution of housing types and sizes
  - ✓ Focus on specific energy services / uses

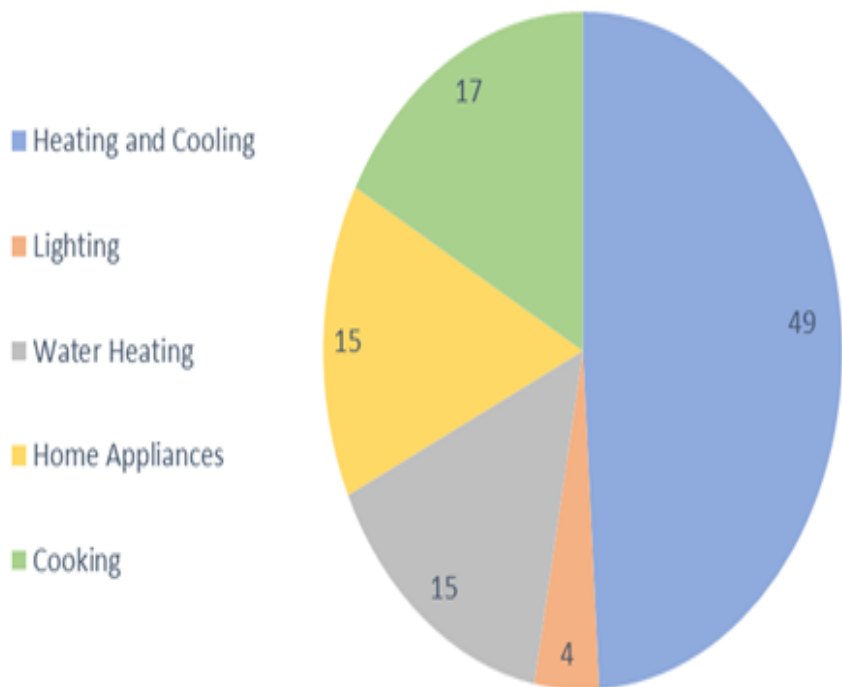
# Example of Results :Overview of the existing tertiary building stock & Summary of its characterization (Jordan)

## Energy profiles and end-uses in the building : (Tertiary), (1), (2), (3)

Sector 2017	Diesel	LPG	Total Oil	Electricity	Solar Energy	Bio Mass	Total Energy	%of Total Energy
<b>Final Energy Consumption</b>	<b>1965.1</b>	<b>511.4</b>	<b>5081.8</b>	<b>1511.3</b>	<b>168.4</b>	<b>60.7</b>	<b>6987.1</b>	<b>62.4</b>
<b>Services (000 toe)</b>	<b>91.3</b>	<b>77.7</b>	<b>169</b>	<b>228.3</b>	<b>37.4</b>	<b>25</b>	<b>459.7</b>	<b>6.58%</b>
<b>Touristic (000 toe)</b>	11.61	64.91	76.51	65.06	7.19	4.81	153.57	<b>33.41%</b>
<b>%</b>	12.71	83.53		28.50	11.53	7.70		
<b>Education (000 toe)</b>	27.92	4.53	32.45	13.27	24.45	16.35	86.51	<b>18.82%</b>
<b>%</b>	30.58	5.83		5.81	39.19	26.20		
<b>Health sector (000 toe)</b>	29.62	6.49	36.11	9.71	4.32	2.88	53.02	<b>11.53%</b>
<b>%</b>	32.44	8.35		4.25	6.92	4.62		
<b>Banking sector (000 toe)</b>	0.65	0.04	0.68	6.54	0.00	0.00	7.23	<b>1.57%</b>
<b>%</b>	0.71	0.05		2.87	0.00	0.00		
<b>Public buildings (000 toe)</b>	21.30	0.77	22.06	49.14	1.44	0.96	73.60	<b>16.01%</b>
<b>%</b>	23.33	0.99		21.52	2.31	1.54		
<b>Commercial (000 toe)</b>	0.21	0.97	1.18	84.58	0.00	0.00	85.77	<b>18.66%</b>
<b>%</b>	0.23	1.25		37.05	0.00	0.00		
<b>%of Total service energy</b>	<b>19.9</b>	<b>16.9</b>	<b>36.76</b>	<b>49.7</b>	<b>8.1</b>	<b>5.4</b>	<b>100.0</b>	
	91.3	77.7	169.0	228.3	37.4	25.0	459.7	100.0%

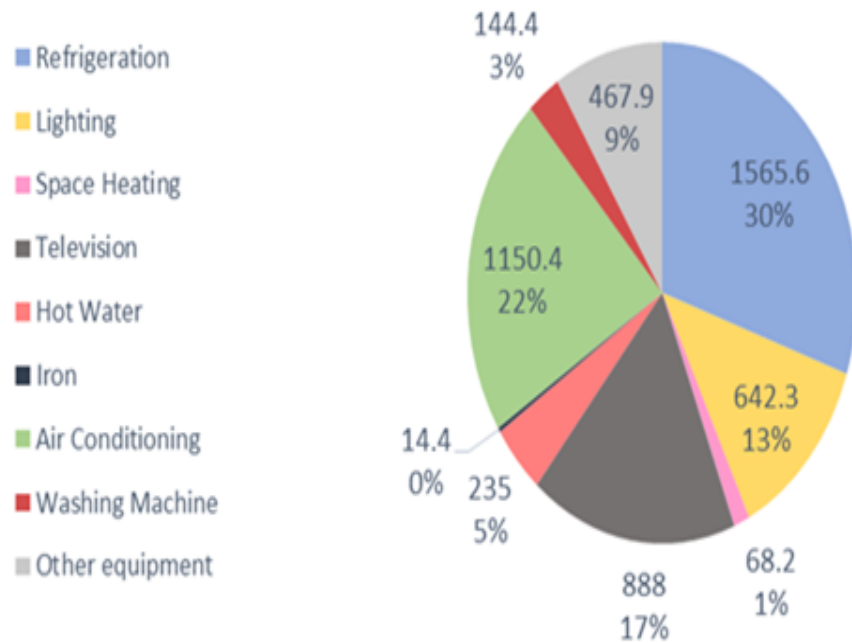
# Example of results : Breakdown of the Electrical Consumption in the Residential Sector (%)- Jordan and Tunisia

Breakdown of the Electrical Energy Consumption in the Residential Sector (%)



**Jordan**

Breakdown of Electrical Energy Consumption by End-use in the Residential Sector (GWh)



**Tunisia**

# Example of results : Breakdown of the Final Energy Consumption by source in the Tertiary Sector (%)- Jordan

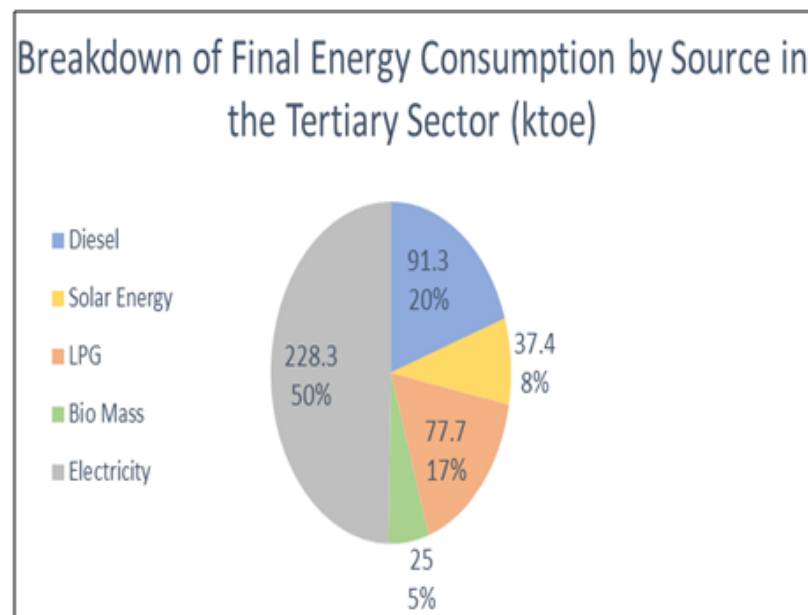
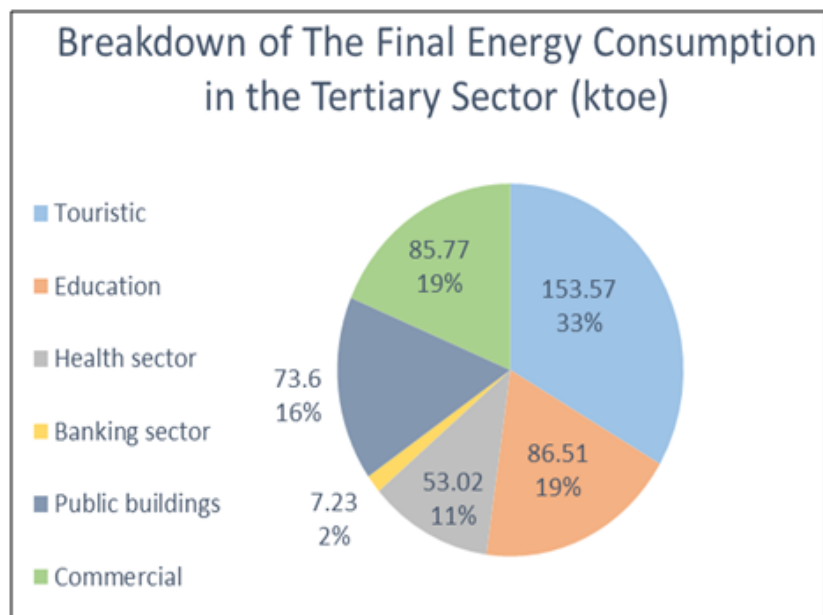


Figure 1: Breakdown of the final energy consumption in the tertiary sector

Figure 2: Breakdown of the final energy consumption by source in the tertiary sector

## Example of results : Evolution of energy consumption in the tourism subsector- Jordan

Subsector	Total Energy Consumption in 2010 (000 toe)	% of Total Energy Consumption in 2010	Total Energy Consumption in 2014 (000 toe)	% of Total Energy Consumption in 2014	Total Energy Consumption in 2017 (000 toe)	% of Total Energy Consumption in 2017
Hotels	37.99	32.9%	32.88	27.4%	46.5	30.3%
Pop Hotels	1.42	1.2%	1.44	1.2%	1.69	1.1%
Apartments and Suites	1.2	1%	1.3	1%	1.48	1%
Restaurants	18.65	16.2%	20.82	17.4%	26.77	17.4%
Pop Restaurants	56.24	48.7%	63.52	53%	77.14	50.22%
Total	115.5	100%	119.95	100%	153.58	100%

## Example of results : Breakdown of the Final Energy and electricity Consumption by source in the Tertiary Sector (%)- Tunisia

Private and Public Subsectors	Total area [x1000 m <sup>2</sup> ]	% of the total area	Final Energy Consumption (toe)	% of the final energy consumption	Electrical Energy Consumption (MWh)	% of electrical energy consumption
Hotels	5,922	11.3	100,826	29.1 %	489,310	15.7%
Office buildings	18,511	35.4	66,249	19.1%	724,155	23.4%
Health	2,433	4.7	26,357	7.6%	204,120	6.6%
Commerce	7,748	14.8	127,615	36.8%	1,445,124	46.5%
Education (Elementary and Secondary)	8,823	16.9	4,182	1.2%	45,025	1.4%
Education (Universities)	4,289	8.2	9,277	2.7%	81,463	2.6%
Others	4,550	8.7	12,071	3.5%	118,756	3.8%



## Example of results : Total area, primary energy consumption and final energy consumption of tertiary buildings by climate zone sector in Tunisia

Climate zones	Total area [x1000 m <sup>2</sup> ]	% of the total area	Primary Energy Consumption (ktoe)	% of the primary energy consumption	Electrical Energy Consumption (GWh)	% of electrical energy consumption
Climate Zone 1	38,378	73.40%	673.2	87.56%	2709	87.20%
Climate Zone 2	11,614	22.20%	78.9	10.27%	331	10.60%
Climate Zone 3	2,283	4.40%	16.7	2.18%	67.5	2.20%
	52,275	100%	768.8	100%	3,108	100%

## Example of results : Total area, primary energy consumption and final energy consumption of residential buildings by climate zone sector in Tunisia

Climate zones	Total area [x1,000,000 m <sup>2</sup> ]	% of the total area	Electrical Energy Consumption (GWh)	% of electrical energy consumption	Primary Energy Consumption (ktoe)	% of primary energy consumption
Climate Zone 1	273.3	64%	3,359.3	64.9%	1,507.4	64.5%
Climate Zone 2	102.5	24%	1,213.3	23.4%	553.2	23.7%
Climate Zone 3	51.2	12%	603.6	11.7%	276.5	11.8%
	427	100%	5,176.2	100%	2,337.1	100%

### 3. Findings on the buildings energy issues, policy and institutional frameworks in Jordan and in Tunisia

---

#### Jordan

- The Jordanian government has eliminated electricity and fuel subsidies. Jordan has also tailored a flat tariff structure for electricity generated from renewable energy sources.
- Financing instruments for energy sustainability in Jordan include a soft-loan, equivalent to 300 million dollars, offered by the Gulf Cooperation Council, and a fund, equivalent to 30 million euros, created by KfW. MEMR has also established the Jordan Renewable Energy and Energy Efficiency Fund, and it is equivalent to 50 million JDs.

### 3. Findings on the buildings energy issues, policy and institutional frameworks in Jordan and in Tunisia

---

#### Jordan

#### Policies, strategies and regulations in force in Jordan aiming to establish sustainable energy systems in the building Sector:

- ✓ Thermal Insulation Code 2009
- ✓ Mechanical Ventilation & AC Code 2018
- ✓ Central Heating Code 2018
- ✓ Natural Ventilation Code 2018
- ✓ Natural Lighting Code 2018
- ✓ Solar Energy Code 2012
- ✓ Energy Efficient Building Code 2010, >>> 2019. ✓
- ✓ Jordan Green Building Guide 2013
- ✓ Thermal Insulation Code Manual 2018
- ✓ Central Heating Code Manual 2018
- ✓ Mechanical Ventilation & AC Code Manual 2018
- ✓ Solar Energy Code Manual, >>> 2019
- ✓ Energy Efficient Building Code Manual, >> 2019

### 3. Findings on the buildings energy issues, policy and institutional frameworks in Jordan and in Tunisia

---

#### Tunisia

- Tunisia has implemented measures to eliminate energy subsidies.
- Tunisia has also established the “Thermal Regulation of New Buildings”.
- Energy labeling for buildings assesses the performance of the building’s envelope, equipment and resource management.
- Moreover, Tunisia is taking action in phasing out inefficient equipment and lighting fixtures such as incandescent bulbs from the market. For example, PROMO-FRIGO aims at replacing 400,000 inefficient refrigerators with more efficient ones by 2023. “PROMO-ISOL” targets installing roof insulation in 65,000 lodgings.

### 3. Findings on the buildings energy issues, policy and institutional frameworks in Jordan and in Tunisia

---

- In its financial measures, **Tunisia** transformed the National Energy Transition Fund (FNME) into the Energy Transition Fund (FTE), whose financing mechanisms were upgraded to include line credits, subsidies, etc. and to participate in the capital of cogeneration facilities.
- **Tunisia and Jordan** have also faced various barriers in its mission in promoting energy efficiency and sustainability. Under the title of institutional and regulatory barriers fell the complexity of administrative procedures that allow carrying out energy renovation activities in buildings. Economic and financial barriers comprised high capital costs and low payback periods, energy subsidies, lack of access of the existing building stock to the financing mechanisms.

## 4. International experience on the refurbishment of existing buildings

---

- Global interest in energy efficiency and renewable energy technologies rose when such technologies were associated with improved energy security and reduced greenhouse gas emissions.
- This section comprises a brief description of the energy performance of the building sector in the following seven countries: **Italy, France, Greece, Chile, Turkey, Tunisia and China.**
- For each country, we presented some data on the energy consumption of the building sector, and we described the legal and financial measures that were developed by each country. Furthermore, we briefly stated some of the barriers that played a role in threatening a proper implementation of the adopted policies.

## 5. Conclusion & Recommendations

---

The main conclusion of the study is the delivery of a unique, up-to-date and very detailed database on:

- the structure and development of residential and tertiary buildings stocks
- energy consumption by source in residential and tertiary buildings and in each climatic zone
- the energy saving potential in residential and tertiary buildings.

This database would be very useful for analyzes and forecasts of energy demand in residential buildings and in the different categories of tertiary buildings by energy source and by climatic zone.

We don't have detailed information on the share of each energy end uses and that we need to develop accurate estimates for those figures.



## 5. Conclusion & Recommendations

---

Based on the country reports, we observe that :

- Jordan and Tunisia are exerting much effort in the energy efficiency field and especially in their building sectors.
- The energy challenges that face each country include limited local energy resources with increasing energy demand.
- The tariff structure in each country was dwelt upon, and we observed that certain reforms have been implemented during recent years. Those reforms resulted in increasing the overall electricity prices, and this will contribute to increasing the financial visibility of EEMs among end-users.
- Upgrading the skills of local EE professionals (in public and private sectors) is a necessity in implementing national energy efficiency strategies.

## 6. Conclusion & Recommendations

---

- Develop client knowledge and product information services through credible professional sources.
- Provide proper incentive and funding schemes and build a system of incentives for contractors to ensure the cost-effectiveness of green buildings.
- Strengthening of governmental incentives through subsidy, rebate program, tax incentive schemes, rating systems and technical assistance.
- Thus, implementing EEMs in this sector might yield to significant energy savings, let alone improving the thermal comfort in indoor areas and reducing greenhouse gas emissions.



Shared Prosperity Dignified Life



# Thank you

**Adel Mourtada,**  
([adel.mourtada@yahoo.fr](mailto:adel.mourtada@yahoo.fr))  
ESCWA International Consultant  
Senior EE Specialist