The MENA Region Initiative as a Model of NEXUS Approach and Renewable Energy Technologies Project (MINARET)

Situational Analysis & Assessments

Al-Karak Municipality

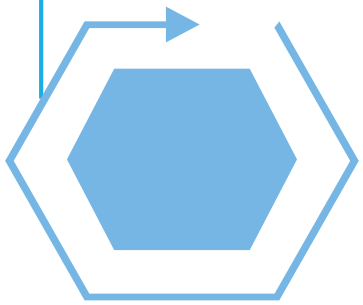
23rd November, 2017

ACKNOWLEDGEMENT

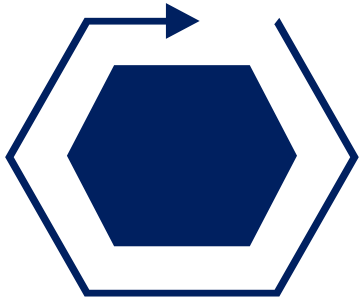
شكر وتقدير

MINARET team would like to show their great gratitude and to express their clear recognition of the support provided by the Mayor of Greater Karak Municipality and staff, distinguished stakeholders and the focal point for the excellent cooperation in implementing the First Year Activities in Karak Municipality.

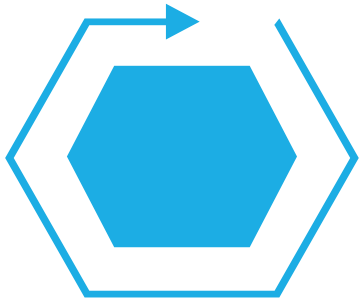
PRESENTATION OUTLINE



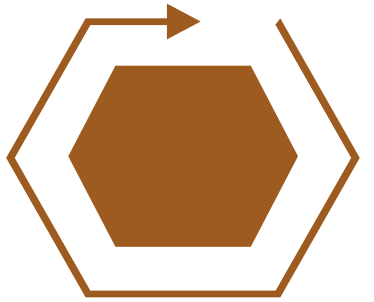
Introduction



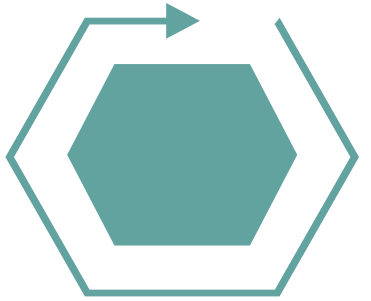
Stakeholders Identification & Policy Assessment



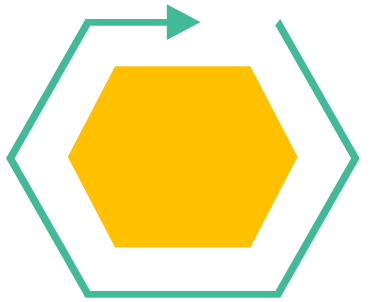
Water Assessment



Socioeconomic Assessment

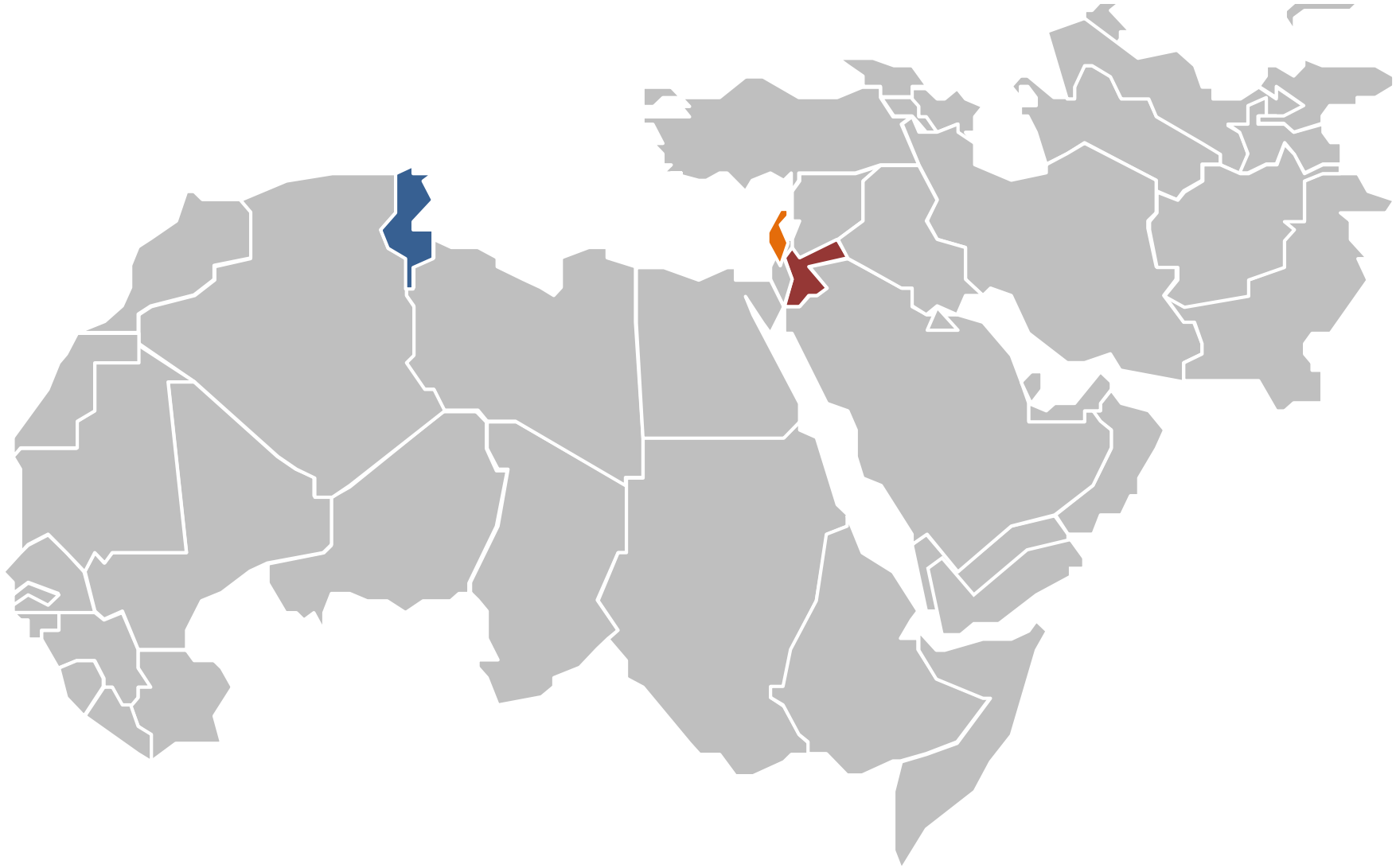


Gender Assessment



Energy Assessment

INTRODUCTION



Tunisia

Lebanon

Jordan

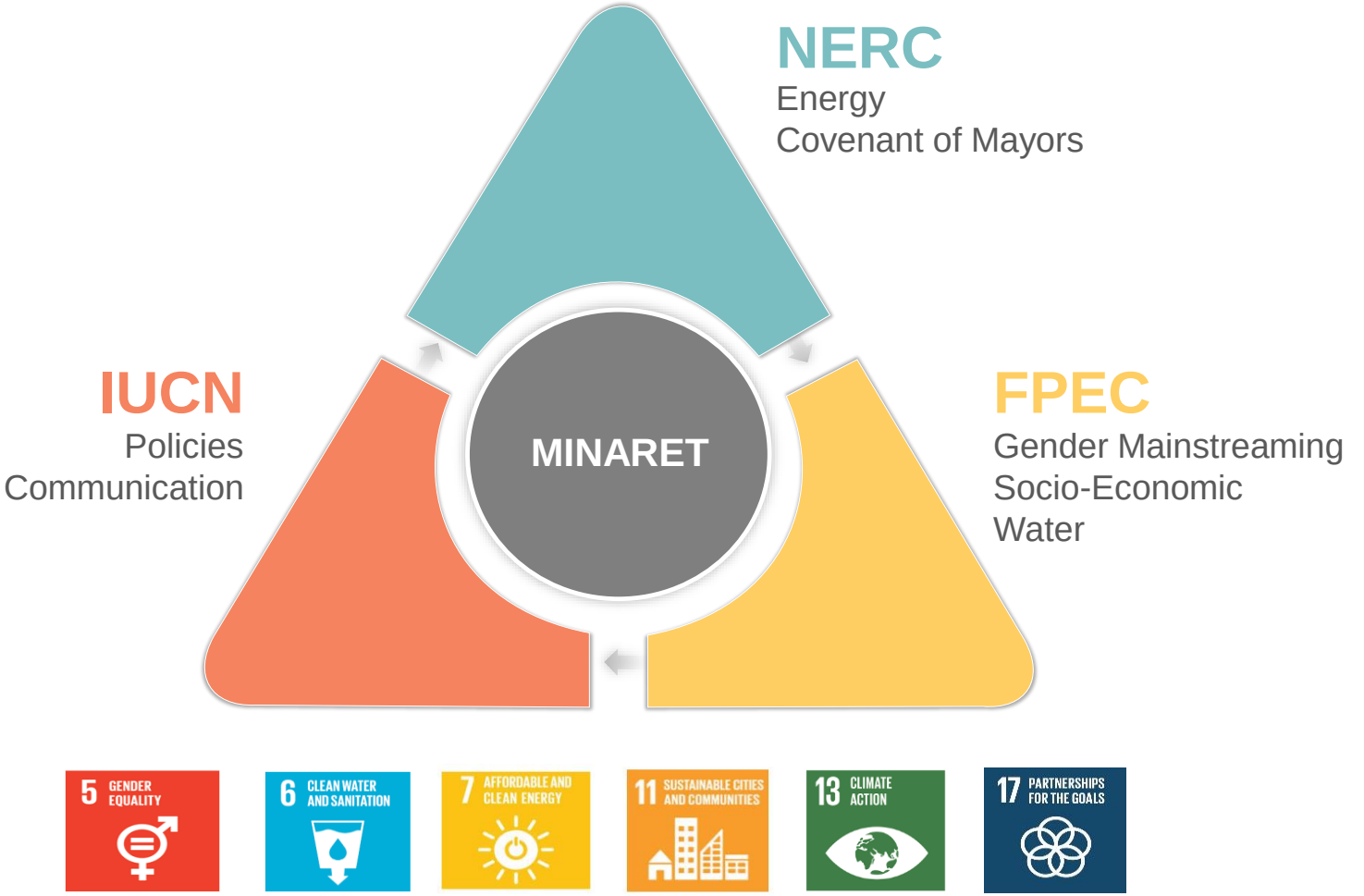
حفل انطلاق المشروع – عمّان - الأردن

حفل انطلاق المشروع – الجديده - لبنان

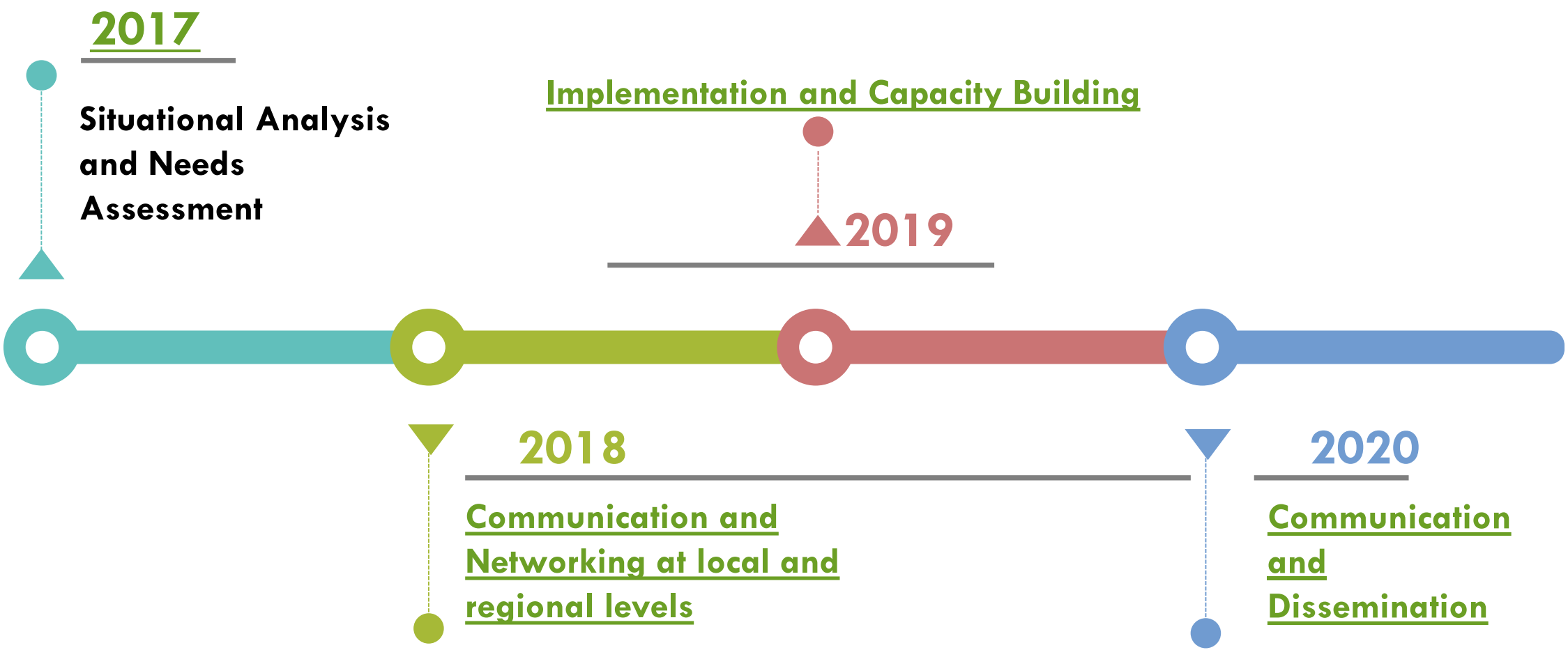
حفل انطلاق المشروع - المنستير- تونس

Introduction

- Review of Year 1 Activities
- Highlights of Year 1 Accomplishments and alignments with SDGs
- Project Timeframe



MINARET PROJECT TIMELINE OVERVIEW



Back to Outline

Stakeholder Analysis at Al Karak Municipality Level

- **A project stakeholder** is defined as ‘an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of the project
- **MINARET stakeholders at Al Karak level** are individuals/entities that have an interest, who are involved or whose work or interest affects or is affected by the sectors of water, food, and energy

(Project Management Institute, 2013 and ISO 21500).

Stakeholder Analysis Objective

- The **overall objective** of the detailed stakeholders' analysis is to draw up each actor or group of actors' profile in relation to specific criteria which allows targeting Al Karak stakeholders potentially to involve in following project design, amendments, developments, activities and monitoring.

- Clearly identify Al Karak area actors who affect and are affected by the project, with a special focus on those involved in different NEXUS sectors and renewable energy technologies

Approach and Methodology

- The assignment was conducted in a **participatory** and **open** way. The main intervention approaches were i) **Rapid Appraisal** and ii) **leave no one behind** as a key approach to involve and stimulate actors and vulnerable groups representation and implication.

- The stakeholder analysis was performed using the following methodology:
  - **Stakeholder Identification**
  - **Stakeholder Workshops**
  - **Stakeholder Analysis**

Stakeholder Workshops

- Two stakeholder workshops were conducted at the municipality of Al Karak.
  - **The first workshop took place on April, 2017**
  - **The second workshop on May, 2017.**

The workshops were planned based on RAAKS tools, SDCA approach, and the EMPOWERS guidelines.

Purpose of stakeholder workshops

- Introduce the stakeholders to each other
- Inform the stakeholders on the project taking place in Jdeidet El Chouf and Semqanieh
- Create platform for stakeholders, where they can explicit their opinions, perceptions, assumptions and judgments
- Improve flows of information between the stakeholders, and create appropriate conditions for innovation
- Train the participants on problem identification and analysis methods, and the development of visions and strategies
- Support the local stakeholders in making technical and political decisions,
- Form shared objectives, beliefs and information among the stakeholders, and
- Identify the stakeholders who could work effectively together, and raise awareness on the factors, constraints and opportunities that affect their performance, which promotes networking among them

Stakeholder Analysis

Stakeholders were classified as primary and secondary based on the following definitions:

- **Primary stakeholders** are those people and groups ultimately affected by the project. This includes intended beneficiaries or those negatively affected.

- **Secondary stakeholders**, are intermediaries in the process of delivering aid to primary stakeholders" and "those who are indirectly affected by the project.

Stakeholders Profile

Stakeholder	Primary / Secondary	Role & Responsibilities	Interest	Problems
Directorate of Water	Primary	- Overall monitoring of the water sector, - water supply and wastewater system and the related projects, - planning and management, the formulation of national water strategies and policies	Covering the people water needs within the WHO standards. Managing water and sanitation issues.	- Water resources shortage, - Weak public water awareness, -weak coordination with other relevant institutions.
Directorate of Agriculture	Primary	Achieving the integrated agricultural development in terms of production and productivity increase both quantitatively and qualitatively (food security)	Conservation of agricultural resources	Water shortage, desertification, infringements on agricultural resources, urbanization, climate change, and land ownership fragmentation.
Directorate of Energy and Mineral Resources	Primary	Comprehensive planning process of the sector, and setting the general plans and ensuring their implementation in a way that achieves the general objectives of the energy sector.	Provision and managing energy and mineral resources.	-High fuel cost, limited fund, limited energy resources, and weak public awareness

Stakeholders Profile

Directorate of Health	Primary	Protecting health by providing high quality and equitable preventive and curative health services by optimizing utilization of resources, technology advances and active partnership with the concerned authorities and by adopting a monitoring and regulatory role related to services concerned with the health of citizens and implied in a national comprehensive health policy	Providing high quality and equitable preventive and curative health services	Weak public awareness, poor heath guidance, and weak laws enforcement
Directorate of Environment	Primary	Maintain and improve the quality of Jordan's environment, conserve natural resources and contribute to sustainable development through effective policies, strategies, legislation, monitoring and enforcement and by mainstreaming environmental concepts into all national development plans.	Eenvironmental protection and conserving natural resources	Weak public awareness, and weak laws enforcement
Environment Associations	Secondary	Protecting the environment at the local level through public awareness and local scale projects	Environmental protection	Limited fund, and poor staff capacity
Cooperative Associations	Secondary	Improving and maintaining the members social and economical situation	Improving members situation	Limited fund

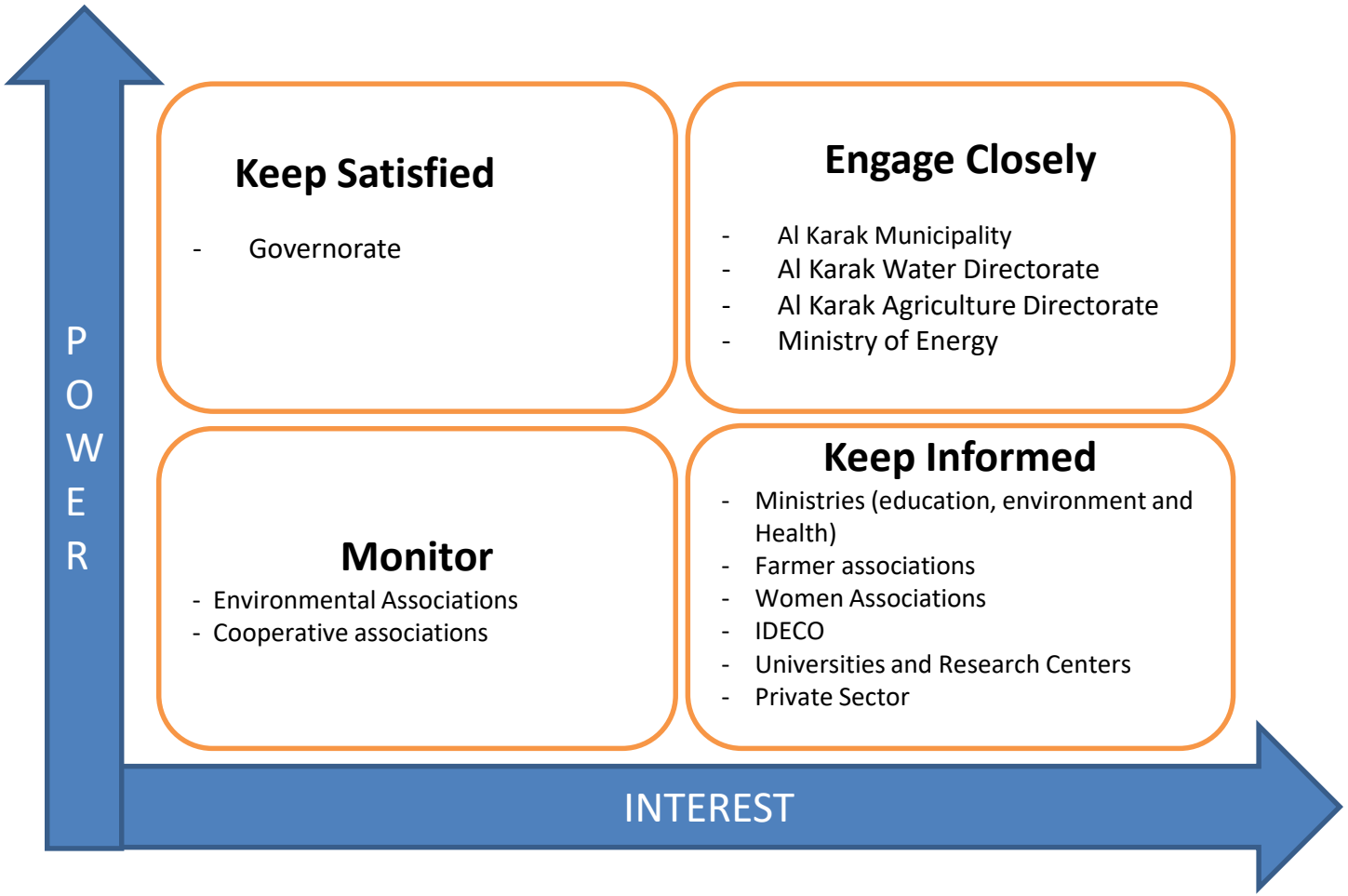
Stakeholders Profile

Civil Society Organizations, and charitable Associations	Secondary	Initiatives and strengthening the role of civil society	strengthening the civil society	Limited fund
Research Centres and Universities	Primary	Developing the community through scientific researches and studies	Guidance and awareness	Weak coordination and cooperation with relevant institutions, and limited fund
Ministry of Education	Primary	Education plays in enhancing human development, and believing in the necessity of achieving a balance between the quantity dictated and the quality desired in the educational system.	increase the level of education and improve its quality	Weak coordination and cooperation with relevant institutions
Ministry of Interior	Primary	Coordination between all parties	Public safety	Reduction of authority
Electricity Company (IDECO)	Primary	Provision of electricity with modernized techniques	Increase the revenues and people satisfaction	Power high cost, and high loss

Stakeholders Profile

Karak Municipality	Primary	Providing the services for inhabitants in best way	Improving the inhabitants situation	Weak financial sources, weak planning, and institutional weakness
Ain Sara Water User Association	Secondary	Managing water allocation of the farmers	Improving the spring and the related infrastructure	Limited fund
Farmers union	Primary	Managing agricultural sector and contributing in solving farmers problems	Improving the farmers revenue	Marketing, climate change, and high price of inputs (water, energy,...)
The Jordanian Hashemite Fund for Human Development JOHUD	Secondary	Link driver of the community, and contributing in solving water-agriculture problems.	Improving living standards of people, and sustain the environment	Limited fund sources to meet the people needs
Women union, Rakeen women society, Mansheiat Abu Hamoud women society,..	Primary	Link driver of the community, empowering women, and public awareness.	Improving women production, and empowering women role	Limited fund, weak capacity, and marginalisation.

Stakeholders classification According to Relative Influence and Importance to the Project



Assessment of Current Policies, Regulatory and Legal Framework on Renewable Energy & Energy Efficiency, Water Management and Food Security NEXUS and Sustainable Development Considering the Climate Change in Close Eye on the Gender

General Remarks

- It obvious that the countries of Jordan, Lebanon and Tunisia identified the linkage between the Water-Energy-Food (WEF) and its linkage to climate change and sustainable development long time before it was launched in Bonn 2011 Nexus Conference.

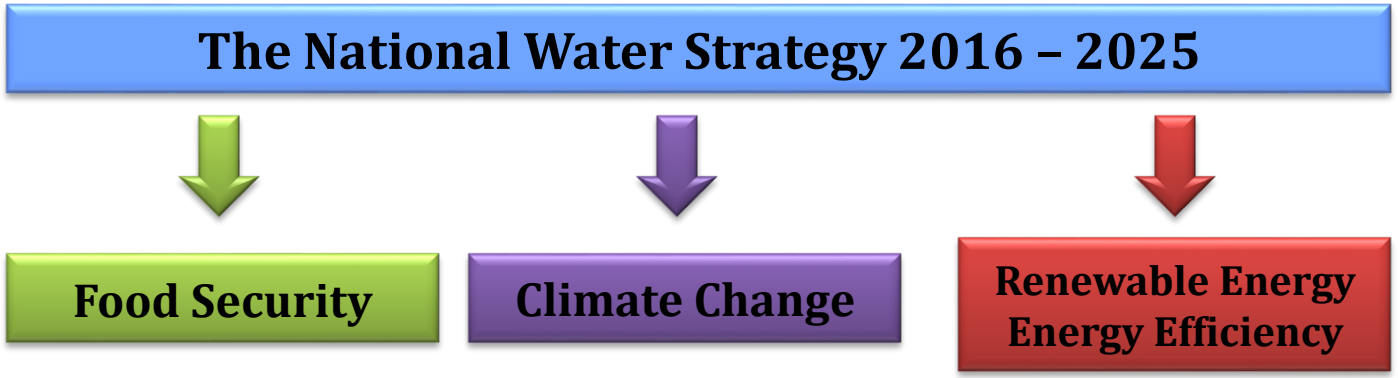
- Since then, Jordan has tremendous efforts (research, workshops, projects and other related activities) related the new NEXUS concept and its relation to climate change and sustainable development. These efforts were leaded weather by the governmental bodies (such as the line ministries and institutions), research centers and universities.. Lebanon, to less extents also, contributed very well to this concept, while in Tunisia this concept was not tackled adequately.

- This could be ascribed to the political unrest that started in Tunisia in the same year that the concept of Nexus was lunched (in 2011) and also to the preferred literature published in French language in both Tunisia and Lebanon.

Linking Water-Energy-Food to Climate Change, Environment and SDGs
Current Strategies, Policies, Regulatory and Legal Framework

The National Water Strategy 2016 – 2025

- This National Water Strategy (2016-2025) included provisions for climate change, water-energy-food nexus, and focus on water economics and financing, sustainability of overexploited groundwater resources and the adoption of the new technologies and techniques available.
- it is in line with the new strategies adopted in other sectors including National Energy Strategy 2007-2020 adopted by the Royal Energy Committee, Agriculture Document of 2009 issued by the Ministry of Agriculture and environmental policy and plan of action developed by the Ministry of Environment.

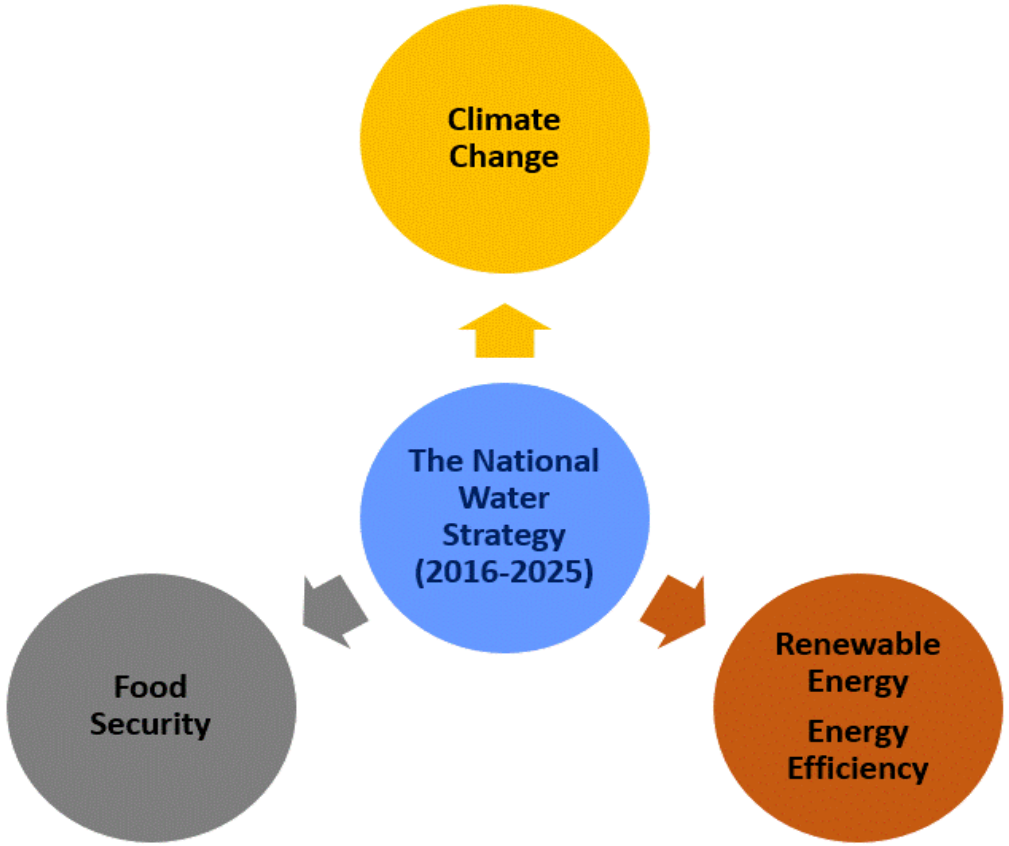


Linking Water-Energy-Food to Climate Change, Environment and SDGs
Current Strategies, Policies, Regulatory and Legal Framework

The National Water Strategy 2016 – 2025

- MWI has also elaborated a set of principles to guide future water sector planning; among other principles: Jordan needs to address the impact of climate change on its social, economic and environmental development. Adaptation measures must ensure institutional response capacity, community education and awareness of the risks.

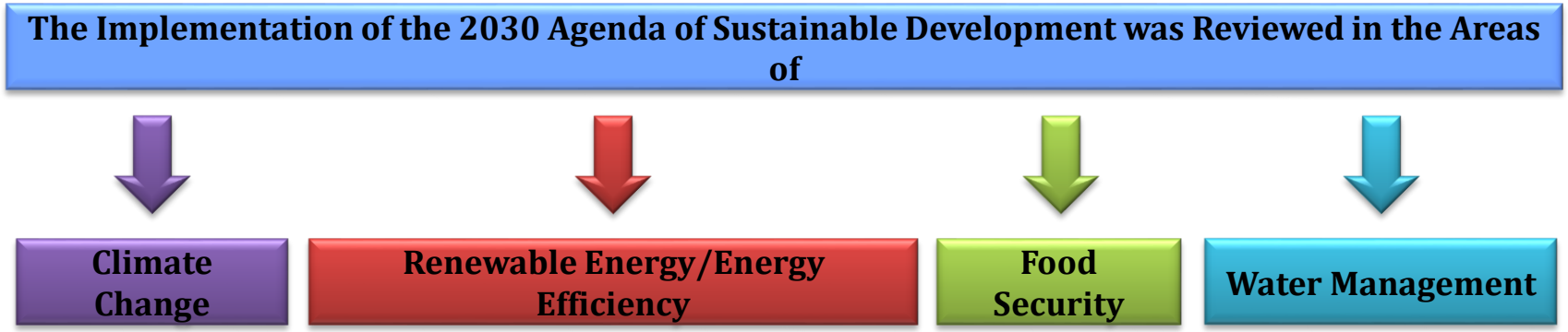
- Jordan's vision for the water-related SDGs envisages a sustainable environment, universal access to sanitation,



Linking Water-Energy-Food to Climate Change, Environment and SDGs
Current Strategies, Policies, Regulatory and Legal Framework

The Implementation of the 2030 Agenda of Sustainable Development was reviewed in the areas of:

- Food Security
- Water Availability and Sustainability
- Affordable and Reliable Energy
- Environment and Climate Change Action
- Gender Equality



Recommendations for Improvements – Policies and Strategies

- Adopt a WEF nexus approach policy making to increase policy coherence among the three sectors and climate change policies to provide integrated solutions and to mitigate nexus-related risks (integrated policies, non-siloed thinking, linking up across sectors and ministries).

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- Governance and institutional structures can be enhanced and strengthened for more effective and integrated resources management through Analyze current national institutional arrangement for better understanding of the weaknesses and gaps that hinder implementing the WEF nexus approach.

Recommendations for Improvements – Partnership and Coordination

- Harness existing multi-stakeholder platforms to improve policy coherence, institutional and social learning and leadership (Multi-stakeholder platforms are needed in order to develop and explore science-policy-society linkages and opportunities to share knowledge, including public sector (legislators, politicians, utilities, among others), private sector (utilities, supply chain, agricultural and industrial sector, etc.), civil society and foreign aid agencies).

- The involvement of civil society in the nexus governance can be an important asset in generating better dialogues and bringing legitimacy and accountability to governing institutions.

- Support and provide incentives for strategic partnerships and cooperation between research centres and the private sector.

- The establishment of a network of leading experts in the region is encouraged to create more synergy in the technical knowledge as well as in transboundary issues, international conventions and legal and institutional aspects.

Recommendations for Improvements - Vulnerable Groups and Gender

- Improve outreach to the vulnerable, such as poor men and women, and the younger and older generations.
- Gender issues and participatory approaches must be integrated into local and regional businesses.
- Ensuring that women are equal partners with men in decision-making over development.
- Reforms are also needed at the local level to effectively integrate gender-aware and participatory approaches into local and regional businesses.

Recommendations for Improvements – Development

- Apply appropriate policy, legislative and economic tools to ensure that basic human needs for the three resources are met at a low, subsidized price, while excessive use is priced at a tariff that reflects cost.
- Mainstream the nexus mental models, concepts, and tools in policy and development plans.
- Ensuring that the environmental and social needs of future generations are reflected in current policies and practices.

Risk Assessment

- The legal, availability of land and/or lack of motivation.
- The dependence on political lobbying is in some cases a risk by itself.
- schools are cited as target groups, their active participation is contingent on timing events and understanding their schooling calendars.
- Media is also cited as a target group but needs to be monitored and well informed.
- Lacks of finances at the municipal level, and the inability for municipalities to raise capital for specific projects underscore the dependency on external funding source.

Selection Criteria for pilot projects

- Should be owned by the municipality;
- Approved by the municipality for other local governmental departments;
- Should be within the allocated budget of the project; and
- In line with the objectives of the MINARET project.

MINARET Project: WATER

- The purpose of the baseline study was to carry out a situational analysis for water and agriculture at the municipality level.
- The boundaries of the study included:
- Karak Municipality in Jordan.
- The following points were addressed for each municipality:

Identification of the existing policy related to the water and agricultural sector

Carry out data collection and analysis of water situation to identify relevant benchmarks for water consumption, resources, treatment and reuse.

Carry out data collection and analysis of current agricultural situation and investigate new and modern agricultural technologies that consume less water and energy.

Recommendation of Pilot projects and Capacity Building programs at the municipality Level.

MINARET Project

Bottom- up Approach

Methodology of data collection

01 Literature Review from online sources, governmental institutions, and previous projects.

02 Meetings with relative Stakeholders

03 Field Surveys and Questionnaires

04 Focus Groups Discussions with the Community and Local NGO's

MINARET Proposed Water Projects #1

- **Project's Name: Water treatment using PV system for food production**
- **Location: Agricultural area in Al-karak (around Ain Sara spring)**

Administration

Al-karak Municipality in cooperation with JCC, Farmers Union, Mutah university and Water Users Association

Estimated Cost

The estimated cost is about 85,000JOD for the production of about 25m3/day.

Synergies with energy component, as solar panels are needed. Also, high quality water can be produced for irrigation purposes

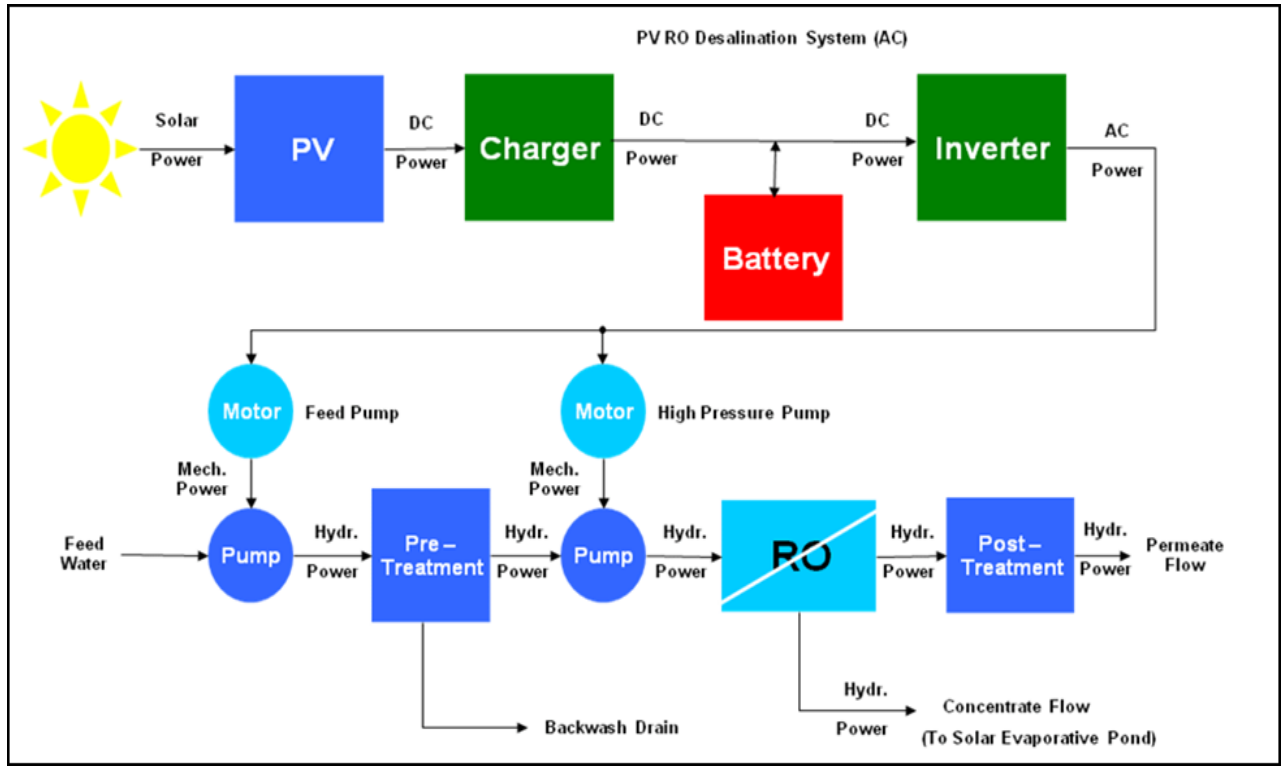
Synergies

Nexus

Gender

Socio-economic

Policies



MINARET Proposed Water Projects #2

- **Project's Name: Adoption of a hydroponic agricultural production technique in one pilot farm.**
- **Location: Pilot farm for training**

Administration

Managed and Implemented by Municipality with water users association, farmers union and JCC

Estimated Cost

The cost for adopting the system is about 20,000JOD/farm for 500m2, and 5,000JOD for training set up.

Water is used for agricultural production with the possibility of running the pump using solar panels

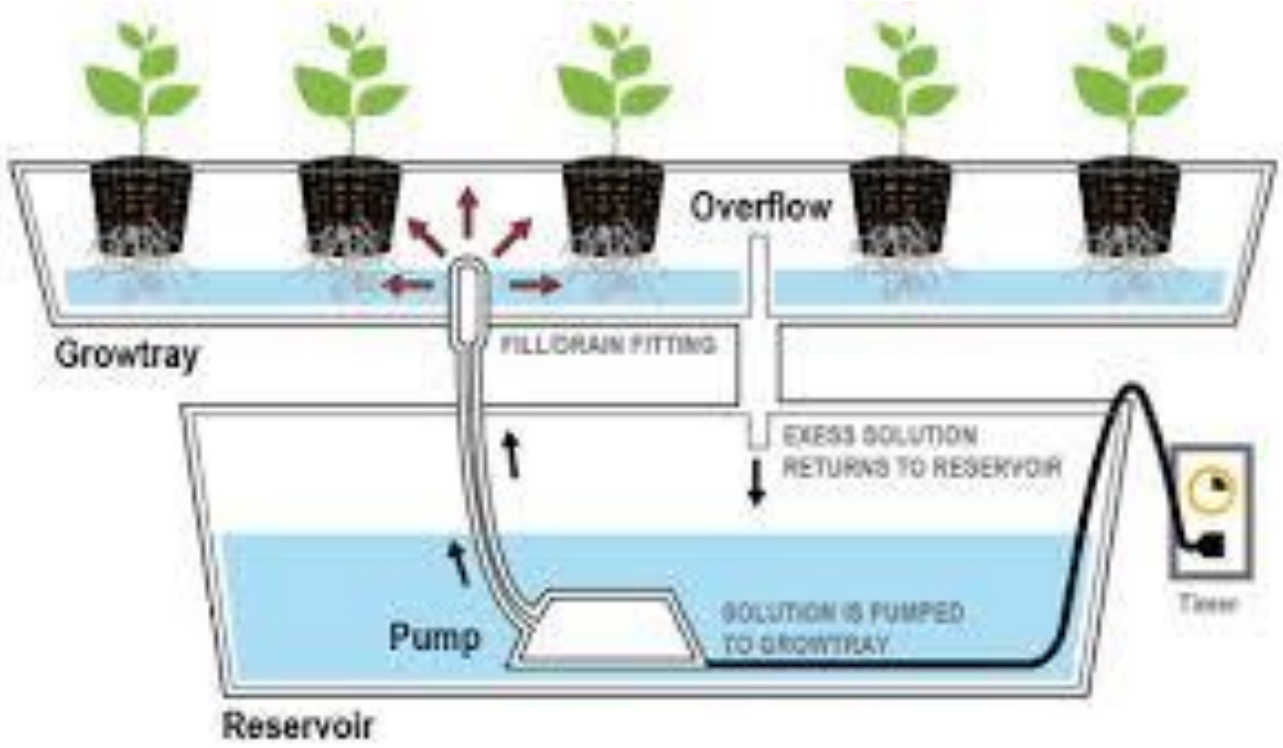
Synergies

Nexus

Gender

Socio-economic

Policies



MINARET Proposed Water Projects #3

- **Project's Name: Water harvesting tanks at the farm level**
- **Location: Along Ain Sara Trail**

Administration

Implemented and managed by Al-Karak Municipality with the help of other entities.

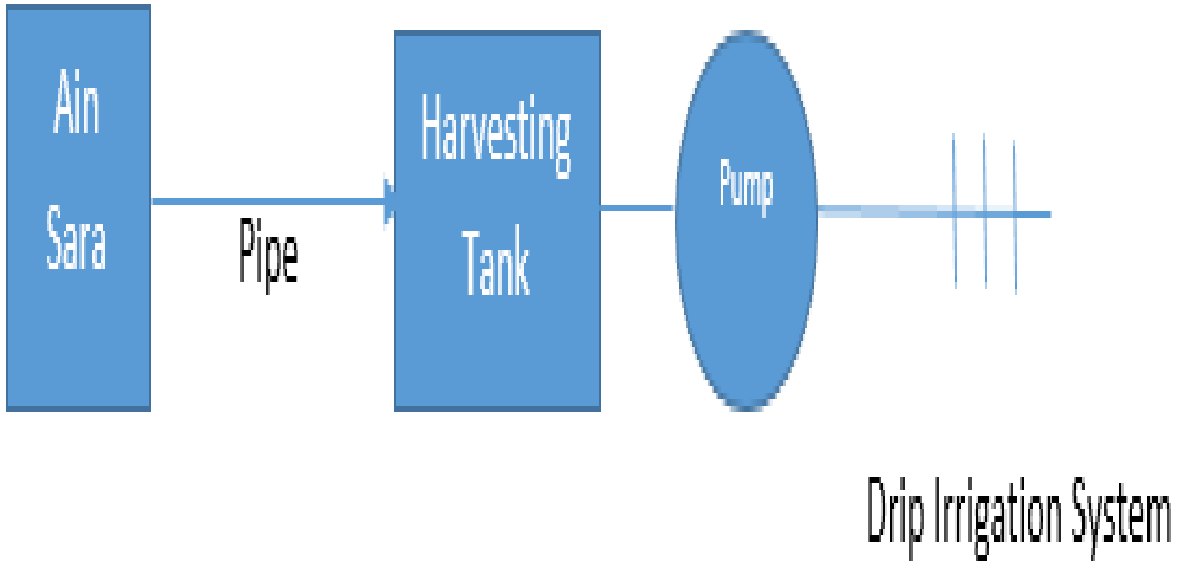
Management of water use by agricultural sector through new techniques

Estimated Cost

- Average cost for one harvesting tank is around 3,000JOD
- The fund can be provided through revolving fund of 60,000JOD to cater 20 farmers at first.

Synergies

Nexus
Gender
Socio-economic
Policies



MINARET Project

- **Project's Name: Upgrading Al-Karak Wastewater treatment plant for reuse of effluent in Forage crops production.**
- **Location: Al-Karak wastewater treatment plant**

Administration

Led by Al-Karak Municipality, WAJ directorate, farmers Union, Water Users Association and Women union

Use of Solar systems for pumping and produce quality effluent for irrigation.

Estimated Cost

- Capital investment by MWI.
- Site preparation and production of irrigation system costs around 1500JOD/Donum.

Synergies

Nexus

Gender

Socio-economic

Policies

MINARET Project: Socio-Economic

- The purpose of the baseline study was to carry out a situational analysis for the socio-economic environment in each municipality.
- The boundaries of the study included:
- Jdeideh Municipality in Lebanon.
- The following points were addressed for each municipality:

- Analyze and understand the demographics and socio-economic atmosphere of the municipalities
- Determine the usage and utilization of energy technology and water management and how they are connected to food security
- Gain better understanding of the community's knowledge, attitude and practice towards energy technology, water management and food security
- Recommendations for potential small initiatives

MINARET Project

Methodology of data collection

01 Literature Review from online sources, governmental institutions, and previous projects.

02 Meetings with relative Stakeholders

03 Field Surveys and Questionnaires

04 Focus Groups Discussions with the Community and Local NGO’s

MINARET Proposed Small Initiative #1

- **Project's Name: Integrate NEXUS Approach for Healthy Ecosystem Services Location: Alkarak Municipality**

Administration

With oversight provided by the Karak Municipality, the supervision of JOHUD and the joint cooperation between Momya Waterfalls society, Rakeen Women Society, and Women's Cooperative Society

Estimated Cost

25,000 JOD

The project will support the rehabilitation of the existing center in Wadi Alkarak *which was co-funded by GOPA/GIZ* . The project *a good example for SDG 17*, and is an opportunity for *new (Partnership) between 4 entities ……*
It mainly aims at protecting the ecosystem by organizing the ecotourism, and create job opportunities.

The project will involves following activities:

- Operate on gray water systems, which will be connected to a small scale orchard planted with lemons and oranges trees.
- Install solar panels which will provide renewable energy for the site.
- Potential of hydroponic farm for production of organic fruits and herbs.

MINARET Proposed Small Initiative

مشروع السياحة البيئية في وادي الكرك
ضمن بلدية الكرك و
تحت مظلة جهد

مركز زوار موميا
Eco lodge

الإدارة جمعية شلالات موميا السياحية

جمعية سيدات
راكين والمنشية

حرف يدوية، منتجات غذائية

مزرعة
عضوية

MINARET Proposed Small Initiative #3

- **Project's Name: Revolving Fund Program**
- **Location: Multiple households**

Administration

It can be managed and implemented by one or more entities such as Rakeen Women society, Al Shareef Cooperative society, Retired Militaries Society, or Women's Cooperative Society under Municipality Supervision

Estimated Cost

25,000 JOD

The initiative provides funding for household and individuals within the municipality boundaries that wish to undertake any activities related to Energy, Water and food security.

The available types of initiatives are:

Solar Home System (SHS).

- Solar Water Heater (SWH).
- Photovoltaic Pumping (PVP)
- Energy Efficient Stoves
- Household's food processing activities
- Maintenance of household's water Plumbing
- Installation of gray water systems at households
- Replacement of household bulbs to LED bulbs
- Rain water harvesting wells
- Drip irrigation system installation

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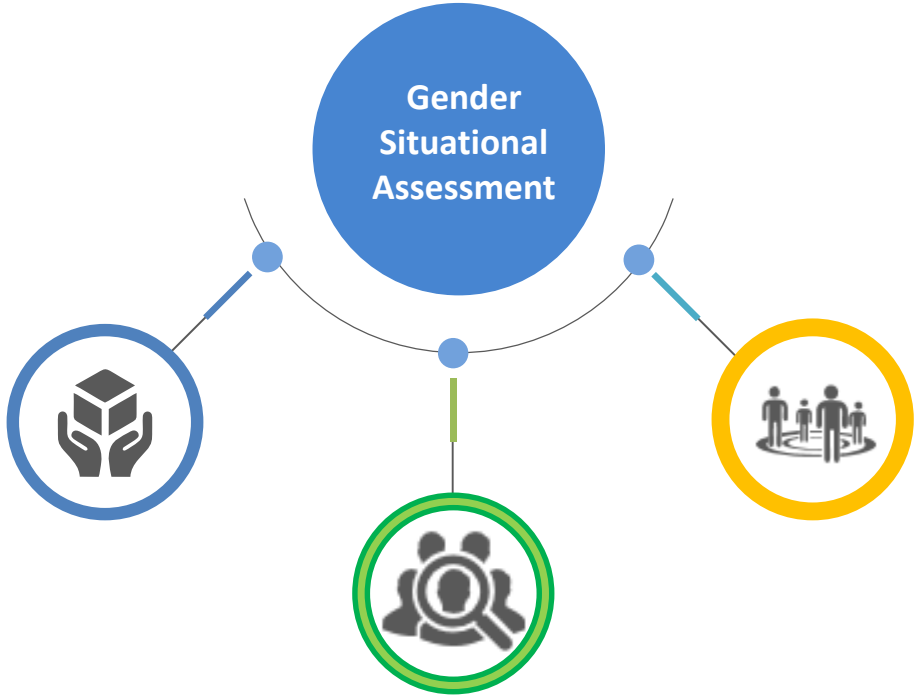
MINARET Project: Gender Assessment

Gender Situational Assessment Coverage

Ensuring 3 levels are covered



Project Partners

NERC, IUCN, FPEC .

Community

Sahab, Karak, Monastir, Jdeidet El-Chouf

Municipality as Institution

Jordan: Sahab Municipality, Karak Municipality, Tunisia: Monastir Municipality
Lebanon: Jdeidet El-Chouf Municipality

Methodology of data collection

01

Project Partner Level

02

Municipality Level

03

Community Level

Applied Tools

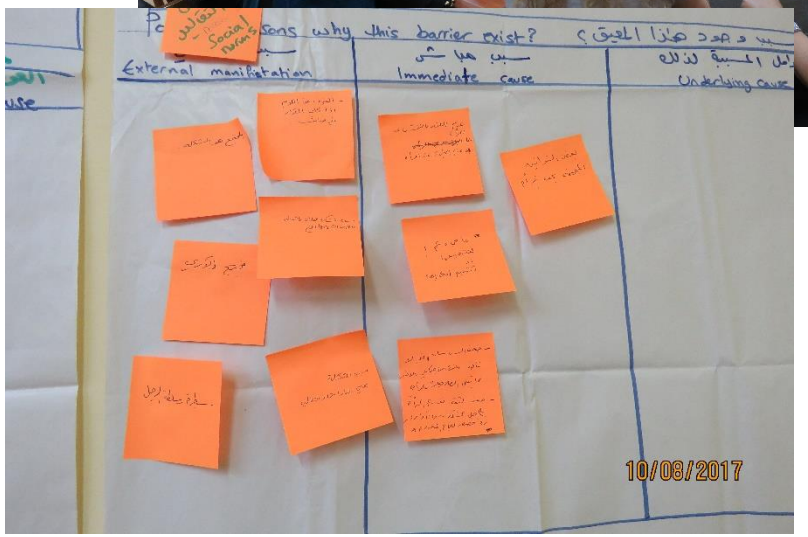
- Interviews
- 1st Level - Self-Assessment Questionnaire
- 2nd Level Self-Assessment Questionnaire

- Literature review
- Direct Interviews
- 1st Level - Self-Assessment Questionnaire
- Focus groups discussions

- Variety of Gender Assessment Tools and Techniques
- Review of Existing Studies/Documents
- Focus Groups discussion
- Site Observation

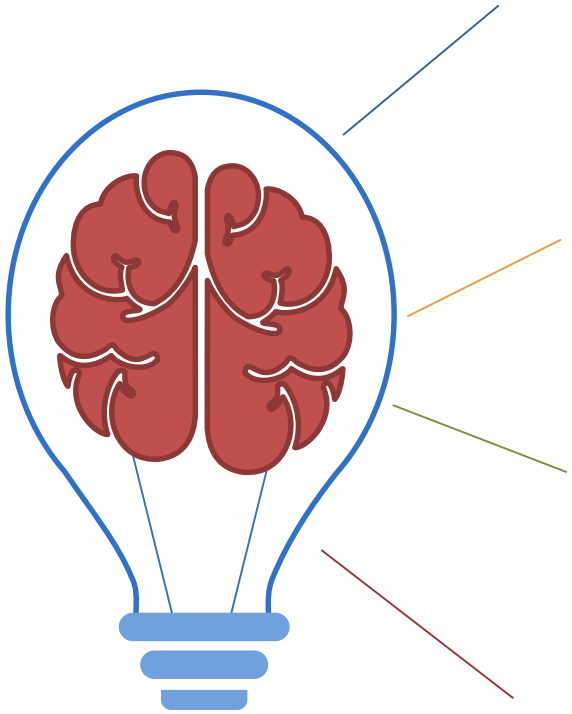
MINARET Project

Methodology of data collection



MINARET Project

Recommendations



Access to credit for energy has to improve women's poverty status in any significant way. So improving access to energy through small initiatives should be done in an integrated approach.

- In Lebanon the typical enterprises women invest in are food-processing, soap production, traditional crafts and most of them lack access to external markets.

- Create opportunities for women to enhance their technical competencies around energy, water and food management by conducting vocational trainings in partnership with national and local vocational centers (Lycee Teqnique).

Work with organizations such as Jdeideh Women Association and the municipality to promote and support income generation opportunities for small, women-owned business promoting water and energy saving technologies.

Back to Outline

1. Central Municipal Building
2. Health Center Building
3. Al-Thanya Administrative building
4. Zahoum Administrative building
5. Manshiet abo-Hammour Administrative building
6. Ader Administrative building
7. Al-shahabye Administrative building
8. Rakien Administrative building
9. Al-Ghwier Administrative building
10. Zaid iben-harthe Administrativ ebuilding
11. Al-jdaydeh Administrative building
12. Al-adnaniya Administrative building
13. Wadi Al-karak Administrative building
14. Baddan and barda Administrative building
15. Al-marj Administrative building
16. Al-hawieh Administrative building
17. Workshop Buildings

1. Central Municipality Building

- EE Systems
- RE Systems

1. Central Municipality Building – EE Systems

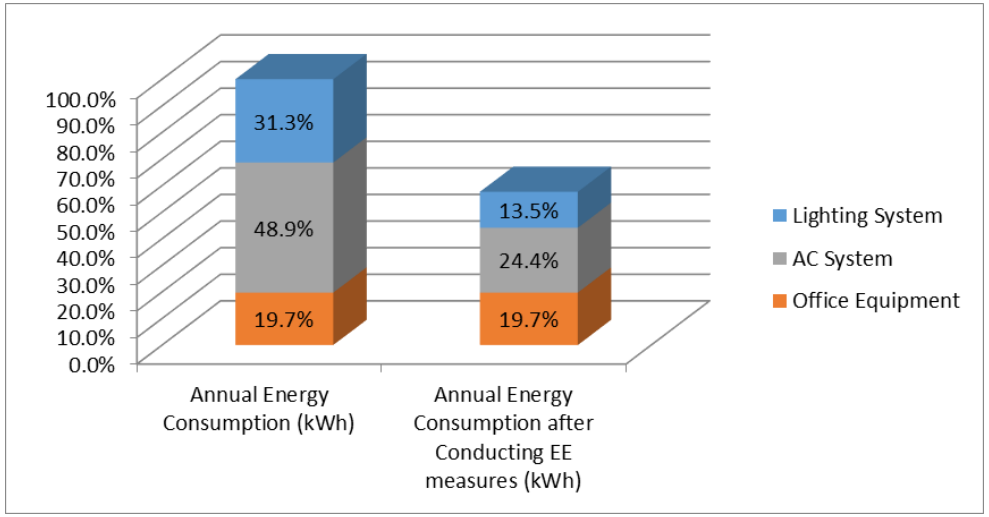
Lighting system

Energy Saving Opportunities	No. of lamps	Total connected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	120	2.16	4915	1177	1080	0.92	2753
Replacing (T8 fluorescent linear tube 18W) with (LED tube 9W)	316	2.84	6472	1549	2212	1.43	3624
Replacing (Circular flourescent tube 32W) with (LED round panel 18W)	10	0.18	358	86	120	1.40	201
Replacing (CFL lamps 60W) with (LED round panel 18W)	6	0.11	323	77	72	0.93	181
Replacing (CFL lamps 27W) with (LED round panel 18W)	126	2.27	1452	347	1512	4.35	813
Replacing Halogen Spot Lamp 14W with LED spot 5W	73	0.37	841	201	365	1.81	471
Replacing (Incandescent lamps 100W) with (LED round panel 18W)	6	0.11	630	151	72	0.48	353
Total		**8.03**	**14990**	**3588**	**5433**	**1.5**	**8394**

1. Central Municipal Building–EE systems

AC System

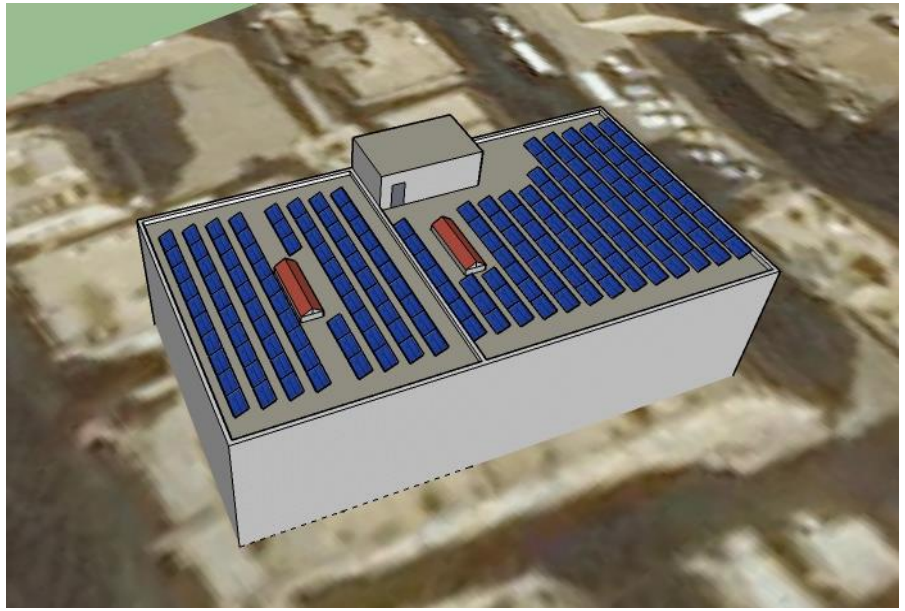
AC's Capacity (Ton)	No.	Total Load (kW)	Total AC Cons. (kWh)	Investment (JOD)	Annual Energy Saving (kWh/yr)	Annual Cost Saving (JOD/yr)	Payback Period (year)
Air Conditioner 1	1	193.27	41231	19700	20700	4955	4.0
Air Conditioner 1.5	4						
Air Conditioner 2	24						



1. Central Municipal Building - RE Systems

PV System

- The total capacity needed to cover the consumption is 54 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 84,240 kWh/year
- Percentage of energy saving: 100% equivalent to 20,170 JD/year
- Investment cost is 40,500 JD and payback period is 2 years

1. Central Municipal Building - RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Central Municipal Building	210	2,900.00	696.00	200	630.00	630.00	2,270.00	544.80	500	1

2. Health Center Administrative Building

- EE Systems
- RE Systems

2. Health Center Administrative Building – EE Systems

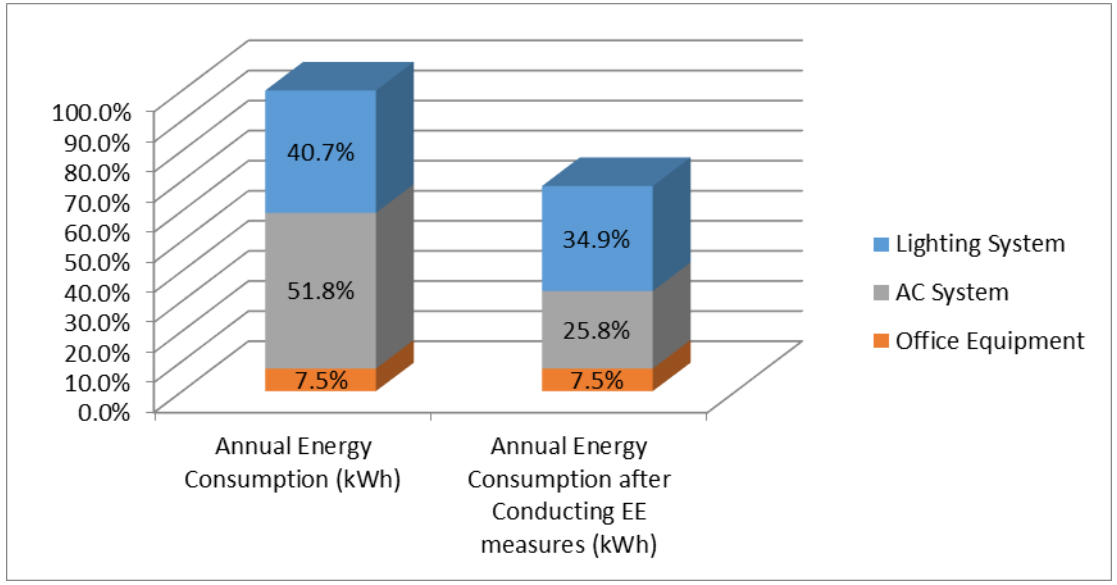
Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expected CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	12	0.22	215	18	108	5.88	120
Replacing (T8 fluorescent linear tube 18W) with (LED tube 9W)	4	0.04	36	3	28	9.14	20
Replacing (CFL lamps 27W) with (LED round panel 18W)	4	0.07	20	2	48	27.86	11
Total		**0.32**	**271**	**23**	**184**	**7.9**	**152**

2. Health Center Administrative Building – EE Systems

AC System

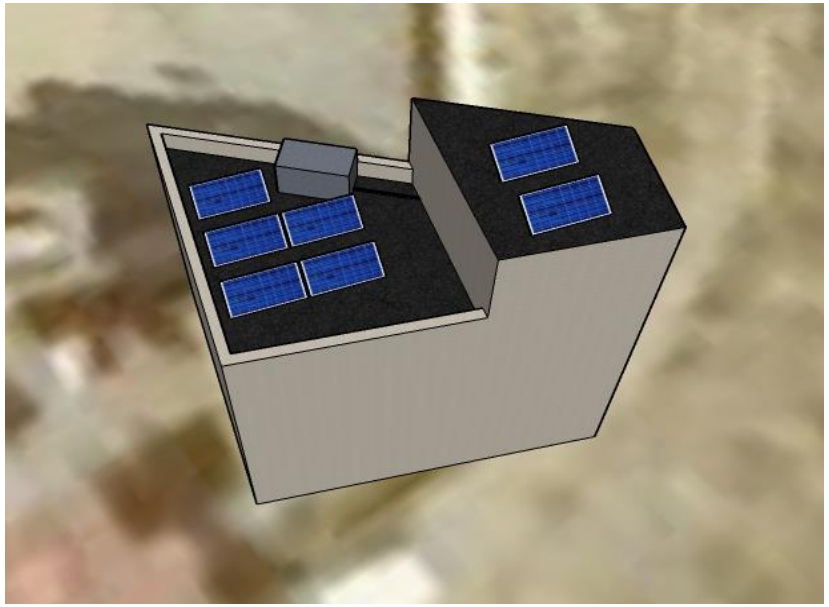
AC's Capacity (Ton)	No.	Total Load (kW)	Total AC Cons. (kWh)	Investment (JOD)	Annual Energy Saving (kWh/yr)	Annual Cost Saving (JOD/yr)	Payback Period (year)
Air Conditioner 1	---	22.84	2436	2500	1223	105	23.9
Air Conditioner 1.5	3						
Air Conditioner 2	1						



2. Health Center Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 3 kWp. However, the available space can fit approximately 2.3 kWp. Therefore , the PV system will not cover the total consumption demand



- The PV system generates approximately 3,588 kWh/year
- Percentage of energy saving: 75% equivalent to 323 JD/year.
- Investment cost is 1,725 JD and payback period is 5.5 years

2. Health Center Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Health Care Center.	50	700.00	126.00	100	150.00	150.00	550.00	99.00	350	4

3. Al-Thanya Administrative Building

- EE Systems
- RE Systems

3. Al-Thanya Administrative Building – EE Systems

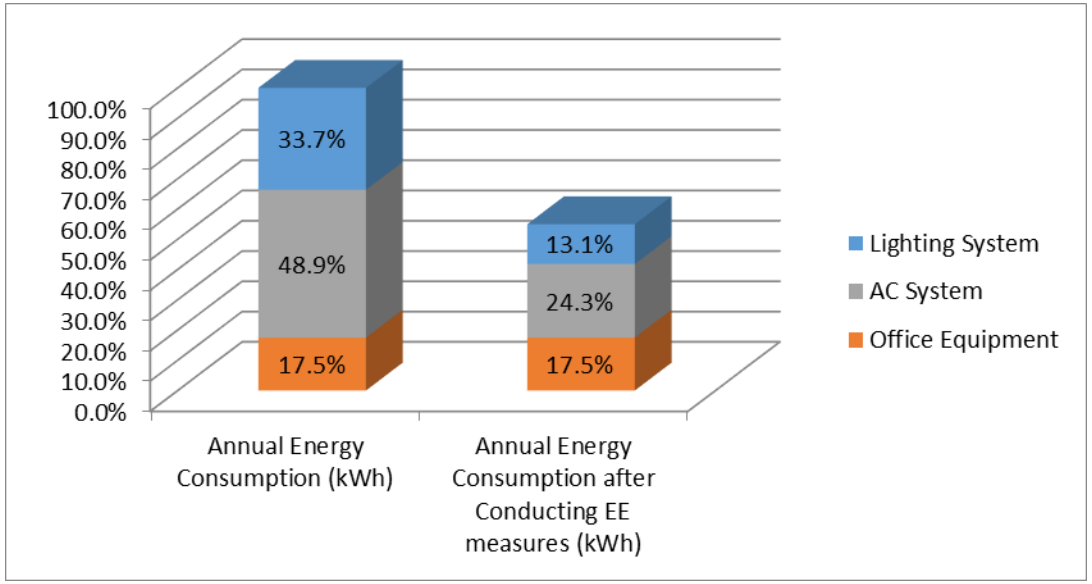
Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	16	0.29	942	83	144	1.73	528
Replacing (CFL lamps 27W) with (LED round panel 18W)	4	0.07	66	6	48	8.21	37
Replacing (Halogen lamps 60W) with (LED round panel 18W)	1	0.02	77	7	12	1.76	43
Total		0.38	1086	96	204	2.1	608

3. Al-Thanya Administrative Building – EE Systems

AC System

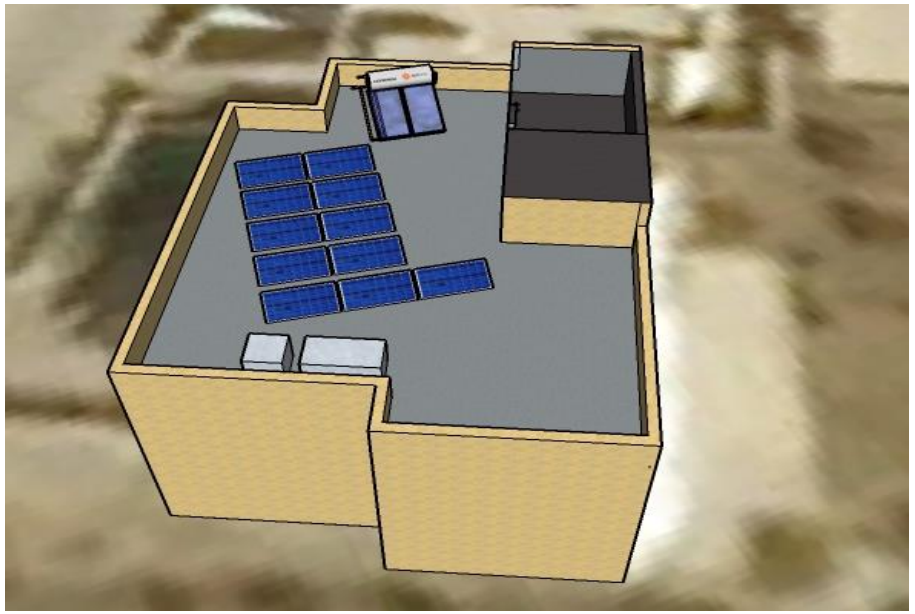
AC's Capacity (Ton)	No.	Total Load (kW)	Total AC Cons. (kWh)	Investment (JOD)	Annual Energy Saving (kWh/yr)	Annual Cost Saving (JOD/yr)	Payback Period (year)
Air Conditioner 1	---	5.27	2586	600	1298	115	5.2
Air Conditioner 1.5	1						
Air Conditioner 2	---						



3. Al-Thanya Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 3.4 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 5,304 kWh/year
- The energy saving: 100% equivalent to 463 JD/year
- Investment cost is 2,550 JD and payback period is 5.5 years

3. Al-Thanya Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Al-Thanya Administrative Building.	50	700.00	63.00	100	150.00	150.00	550.00	49.50	500	10

4. Zahoum Administrative Building

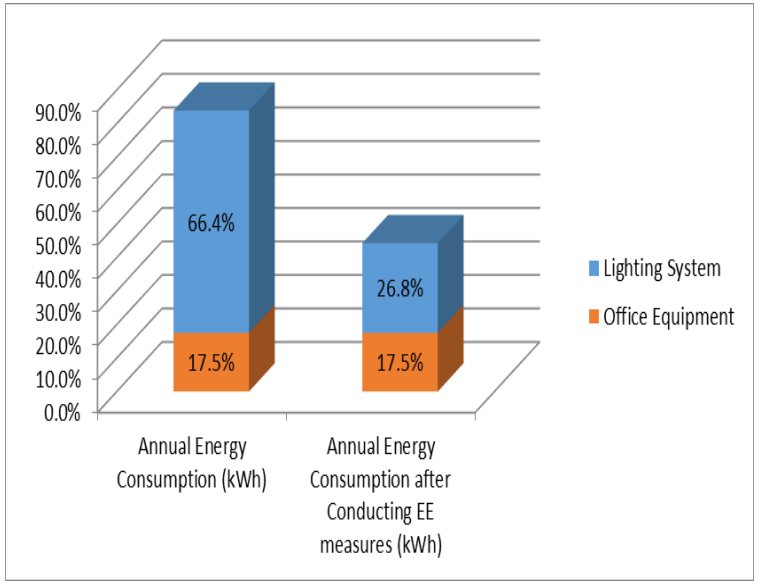
EE Systems

RE Systems

4. Zahoum Administrative Building – EE systems

Lighting System

Replacing Lighting Units	No. of lamps	Total connected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	1	0.02	19	2	9	4.61	11
Replacing (Circular flourescent tube 32W) with (LED round panel 18W)	13	0.21	234	24	156	6.56	131
Replacing (CFL lamps 27W) with (LED round panel 18W)	5	0.09	27	3	60	21.85	15
Total		0.32	280	28	225	7.9	157



4. Zahoum Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 0.6 kWp. However, the rooftop of the building is not part of the municipality building possession, **therefore the municipality can not install RE system.**

4. Zahoum Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Zahoum Administrative Building.	50	700.00	70.00	100	150.00	150.00	550.00	55.00	500	9

5. Munshiet Abo-Hamour Administrative Building

EE Systems

RE Systems

5. Munshiet Abo-Hamour Administrative Building – EE Systems

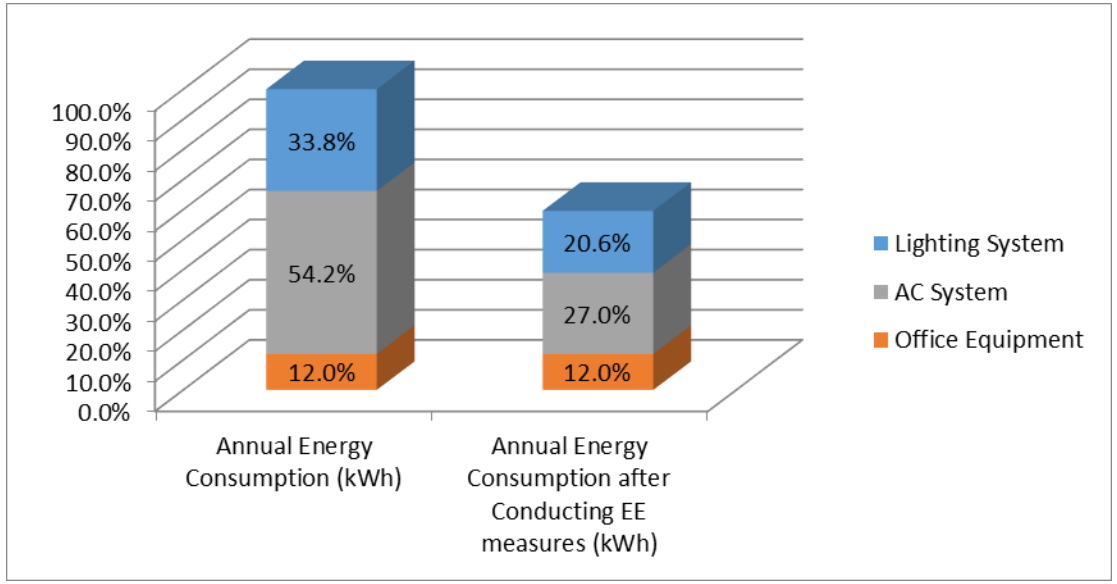
Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	19	0.34	657	67	171	2.54	368
Replacing (CFL lamps 27W) with (LED round panel 18W)	6	0.11	58	6	72	12.05	33
Replacing (Halogen lamps 60W) with (LED round panel 18W)	6	0.11	272	28	72	2.58	152
Total		0.56	987	101	315	3.1	553

5. Munshiet Abo-Hamour Administrative Building – EE Systems

AC System

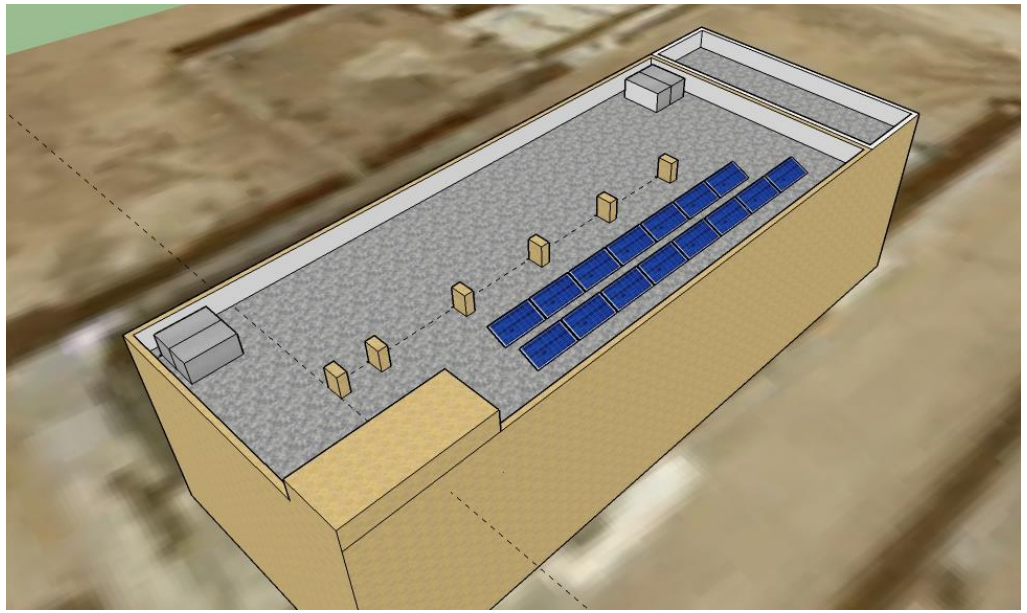
AC's Capacity (Ton)	No.	Total Load (kW)	Total AC Cons. (kWh)	Investment (JOD)	Annual Energy Saving (kWh/yr)	Annual Cost Saving (JOD/yr)	Payback Period (year)
Air Conditioner 1	---	31.63	4048	3600	2032	208	17.3
Air Conditioner 1.5	6						
Air Conditioner 2	---						



5. Munshiet Abo-Hamour Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 4.8 kWp. The available space is sufficient for the required capacity.



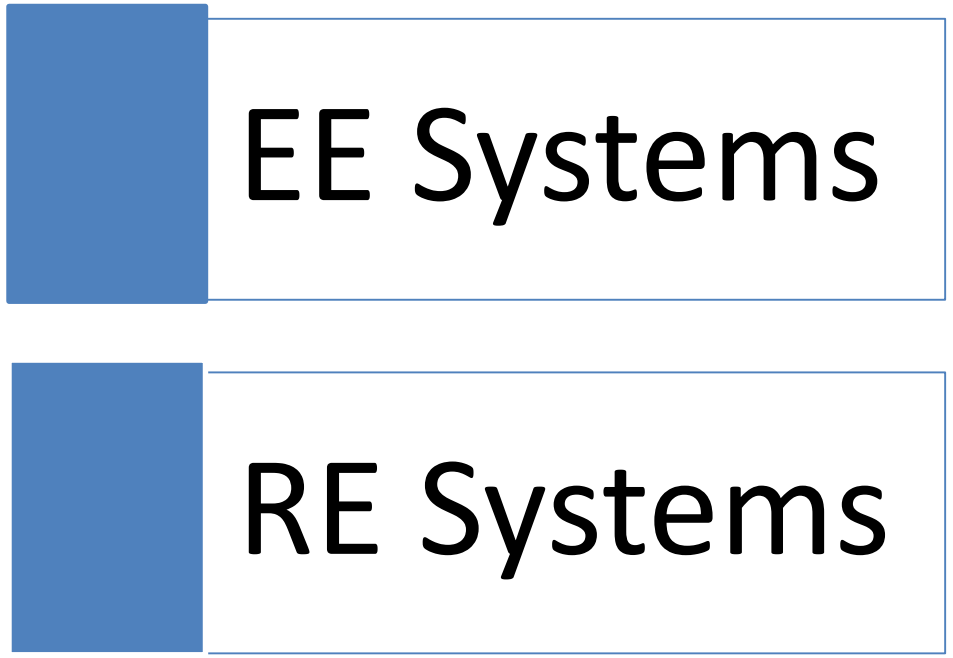
- The PV system generates approximately 7,488 kWh/year
- The energy saving: 100% equivalent to 765 JD/year
- Investment cost is 3,600 JD and payback period is 4.5 years

5. Munshiet Abo-Hamour Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Manshiet Abo-Hammour Administrative Building.	100	1,400.00	140.00	100	300.00	300.00	1,100.00	110.00	350	3

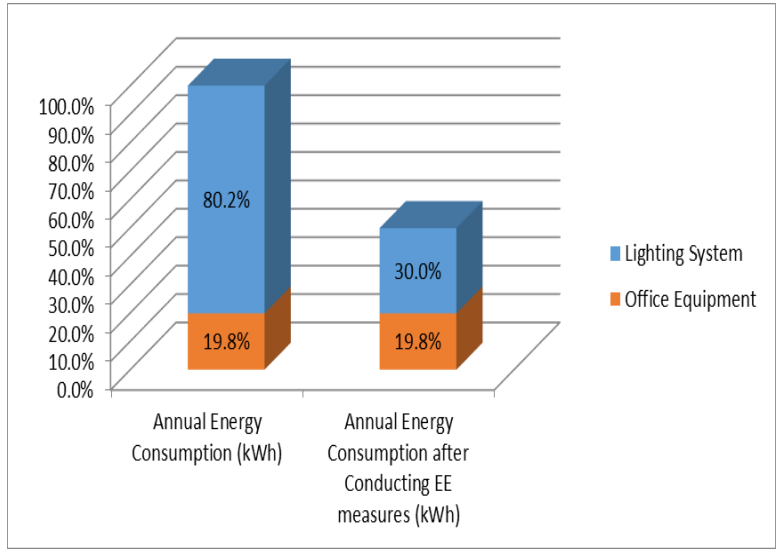
6. Ader Administrative Building



6. Ader Administrative Building – EE Systems

Lighting System

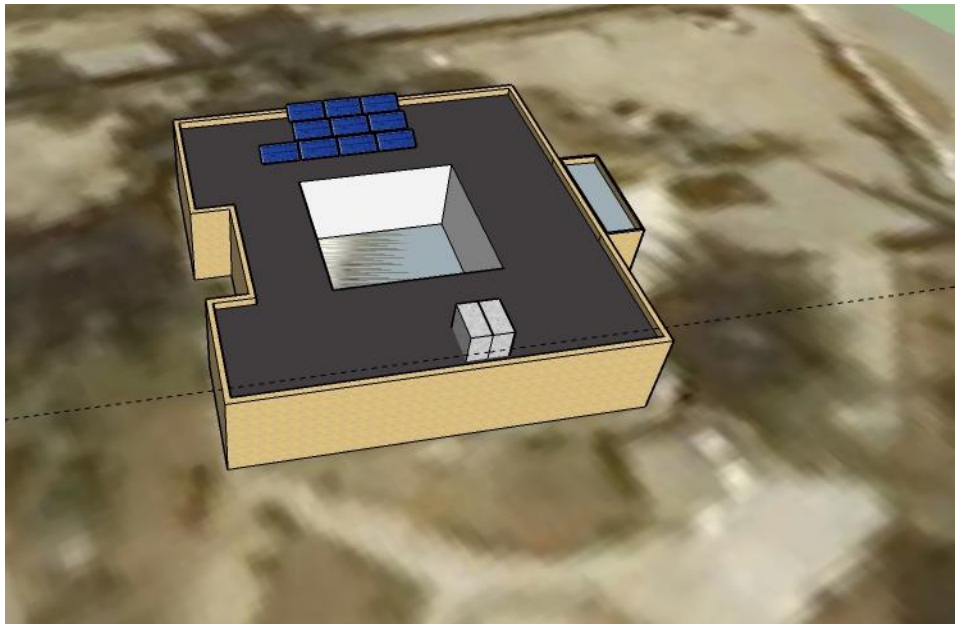
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	91	1.64	1602	140	819	5.86	897
Replacing (Halogen lamps 60W) with (LED round panel 18W)	33	0.59	762	67	396	5.95	427
Replacing (Flood light MH 250W) with (LED Flood light 180W)	3	0.54	182	16	450	28.41	102
Total		2.77	2545	222	1665	7.5	1425



6. Ader Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 3.3 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 5,148 kWh/year
- The energy saving: 100% equivalent to 443 JD/year
- Investment cost is 2,475 JD and payback period is 5.5 years

6. Ader Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Ader Administrative Building.	50	700.00	63.00	100	150.00	150.00	550.00	49.50	500	10

7. Al-Shahabye Administrative Building

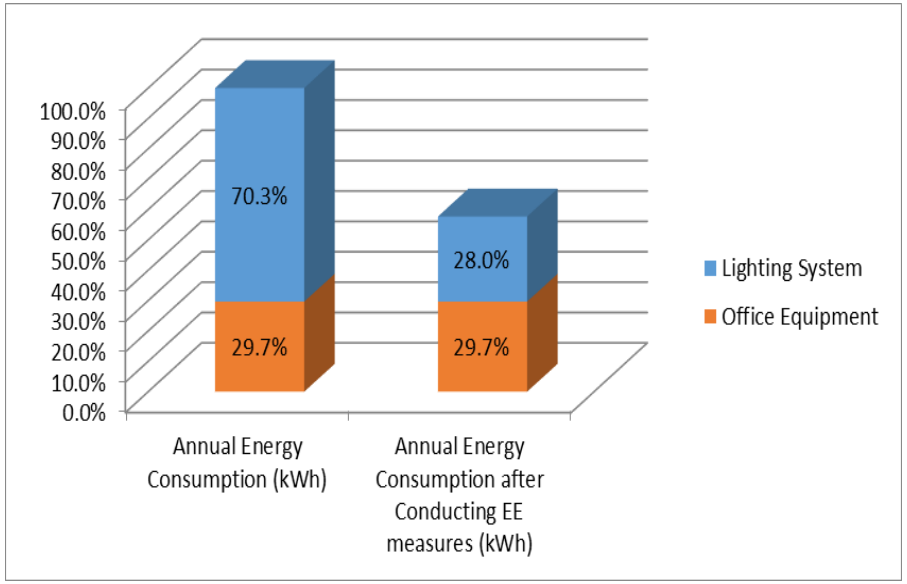
EE Systems

RE Systems

7. Al-Shahabye Administrative Building – EE Systems

Lighting System

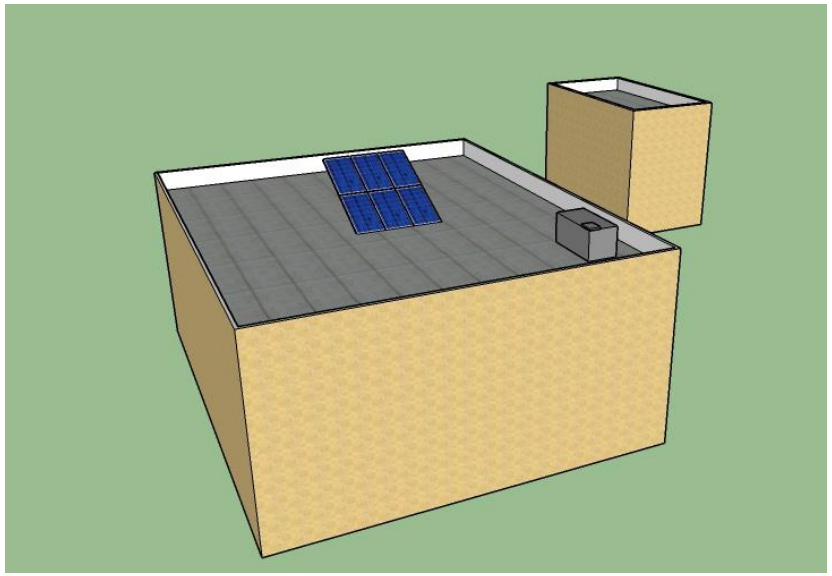
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	14	0.25	717	52	126	2.44	401
Replacing (CFL lamps 60W) with (LED round panel 18W)	4	0.07	269	19	48	2.48	151
Replacing (CFL lamps 27W) with (LED round panel 18W)	7	0.13	101	7	84	11.57	56
Total		0.45	1086	78	258	3.3	608



7. Al-Shahabye Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 1.6 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 2,500 kWh/year
- The energy saving: 100% equivalent to 181 JD/year
- Investment cost is 1,200 JD and payback period is 6.5 years

7. Al-Shahabye Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Al-Shahabye Administrative Building.	20	300.00	21.00	100	60.00	60.00	240.00	16.80	500	30

8. Rakien Administrative Building

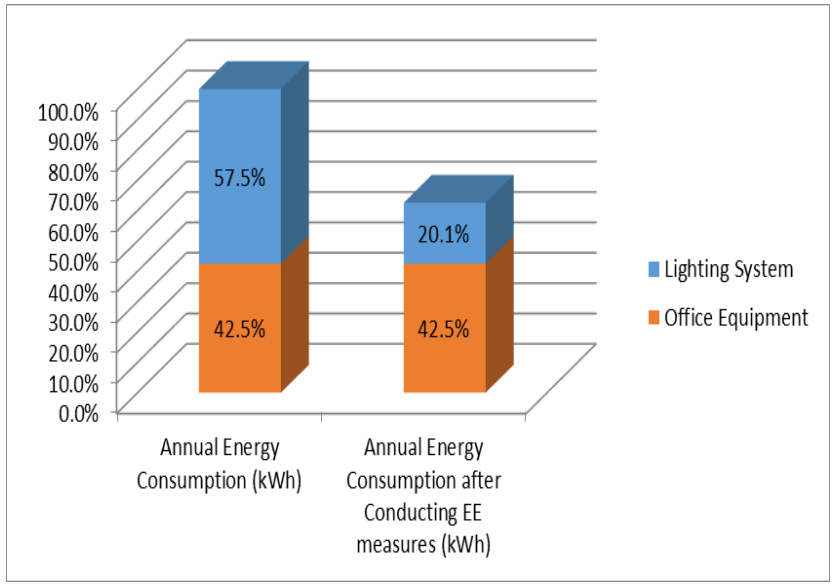
EE Systems

RE Systems

8. Rakien Administrative Building – EE Systems

Lighting System

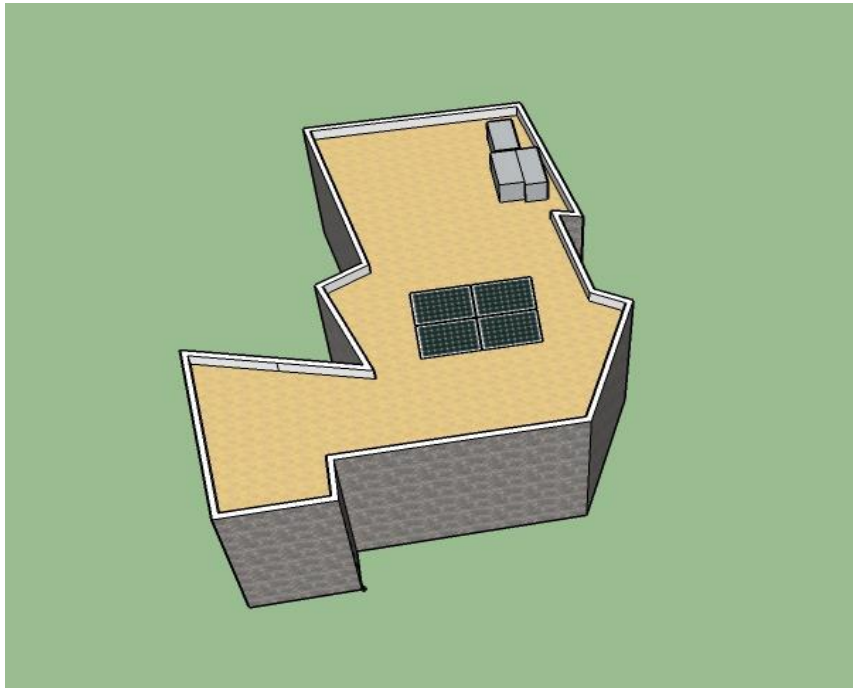
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	16	0.29	369	26	144	5.58	206
Replacing (Circular flourescent tube 32W) with (LED round panel 18W)	6	0.10	130	9	72	7.94	73
Replacing (Halogen lamps 60W) with (LED round panel 18W)	3	0.05	91	6	36	5.67	51
Total		0.44	589	41	252	6.1	330



8. Rakien Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 1 kWp. The available space is sufficient for the required capacity.



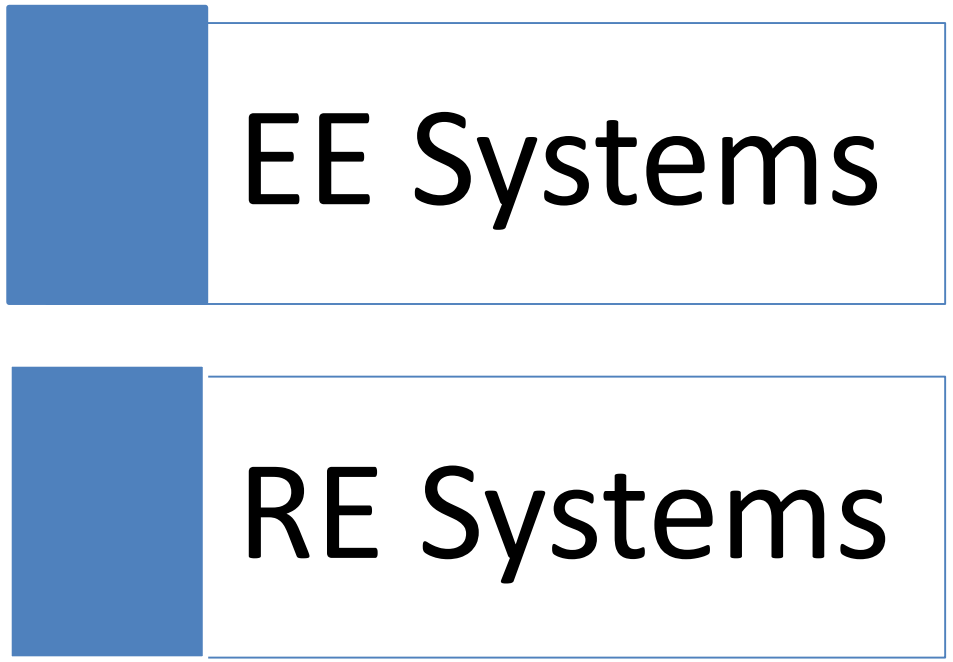
- The PV system generates approximately 1,560 kWh/year
- The energy saving: 100% equivalent to 110 JD/year
- Investment cost is 750 JD and payback period is 7 years

8. Rakien Administrative Building–RE systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Rakien Administrative Building.	100	1,400.00	98.00	100	300.00	300.00	1,100.00	77.00	500	6

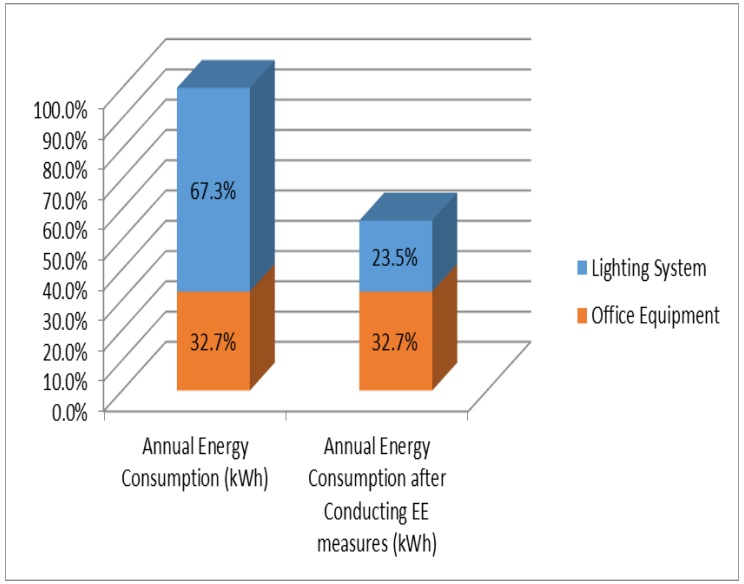
9. Al-Ghweir Administrative Building



9. Al-Ghweir Administrative Building – EE Systems

Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	13	0.23	266	22	117	5.33	149
Replacing (CFL lamps 27W) with (LED round panel 18W)	3	0.05	17	1	36	25.29	10
Replacing (Flood light Mercury 150W) with (LED Flood light 50W)	2	0.10	179	15	80	5.42	100
Total		0.39	463	38	233	6.1	259



9. Al-Ghweir Administrative Building –RE systems

PV System

- The total capacity needed to cover the consumption is 0.7 kWp. The available space is sufficient for the required capacity.

- The PV system generates approximately 1,092 kWh/year
- The energy saving: 100% equivalent to 84 JD/year
- Investment cost is 525 JD and payback period is 6.5 years

9. Al-Ghweir Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Al-Ghweir Administrative Building.	50	700.00	56.00	100	150.00	150.00	550.00	44.00	500	11

10. Zaid Ibn-Harthe Administrative Building

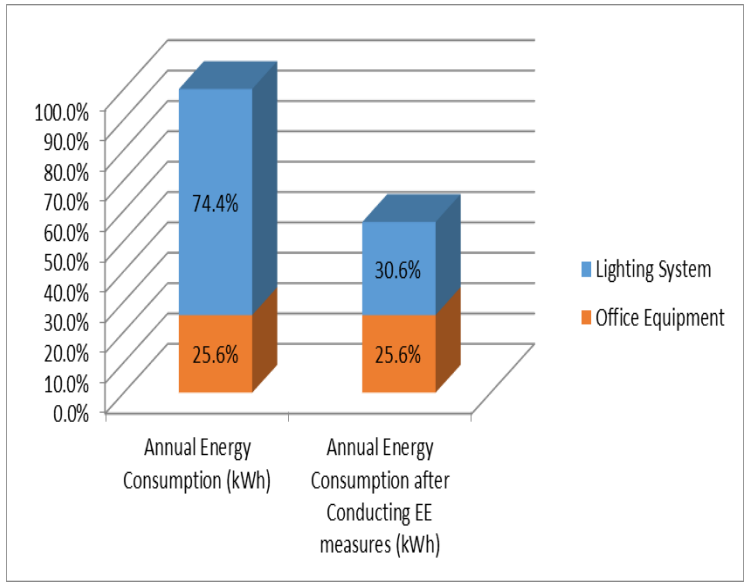
EE Systems

RE Systems

10. Zaid Ibn-Harthe Administrative Building – EE Systems

Lighting System

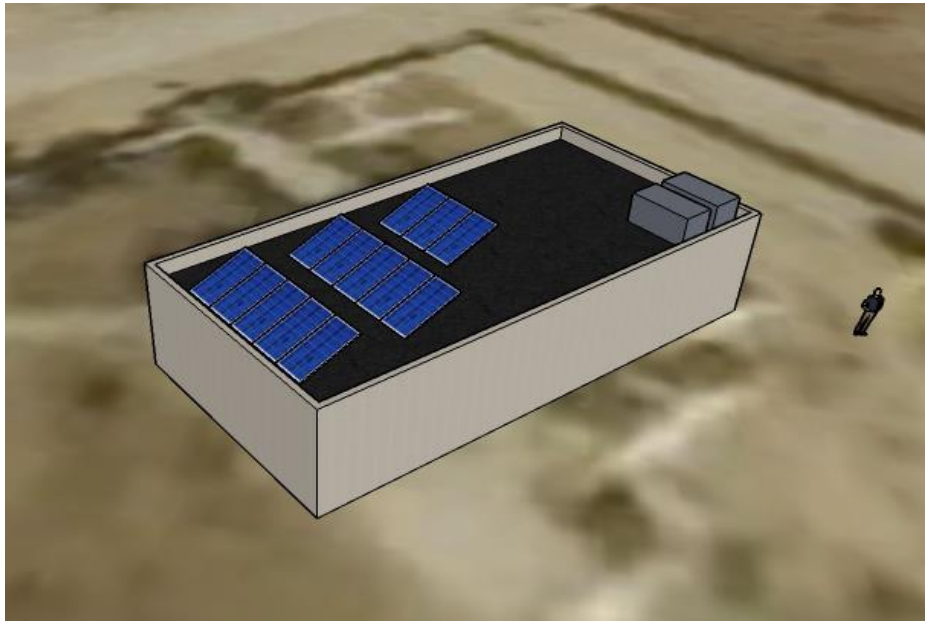
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	32	0.58	2458	228	288	1.26	1376
Replacing (CFL lamps 27W) with (LED round panel 18W)	12	0.22	259	24	144	5.99	145
Total		0.79	2717	252	432	1.7	1521



10. Zaid Ibn-Harthe Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 4 kWp. The available space is sufficient for the required capacity.



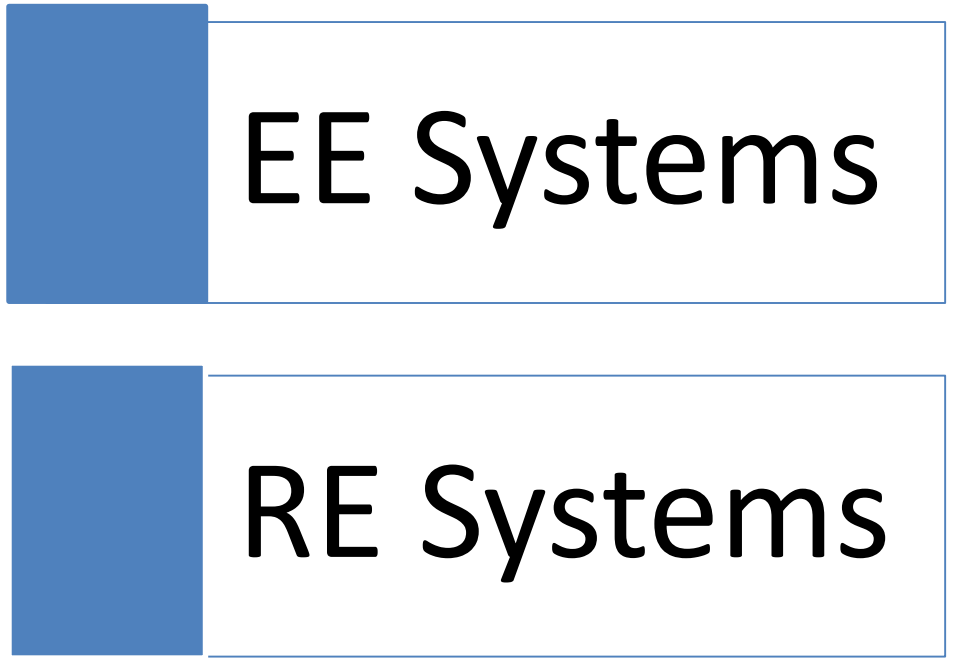
- The PV system generates approximately 6,240 kWh/year
- The energy saving: 100% equivalent to 571 JD/year
- Investment cost is 3,000 JD and payback period is 5.5 years

10. Zaid Ibn-Harthe Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Zaid Ebn Hareth Administrative Building	50	700.00	63.00	100	150.00	150.00	550.00	49.50	500	10

11. Al-Jdaydeh Administrative Building



11. Al-Jdaydeh Administrative Building –EE systems

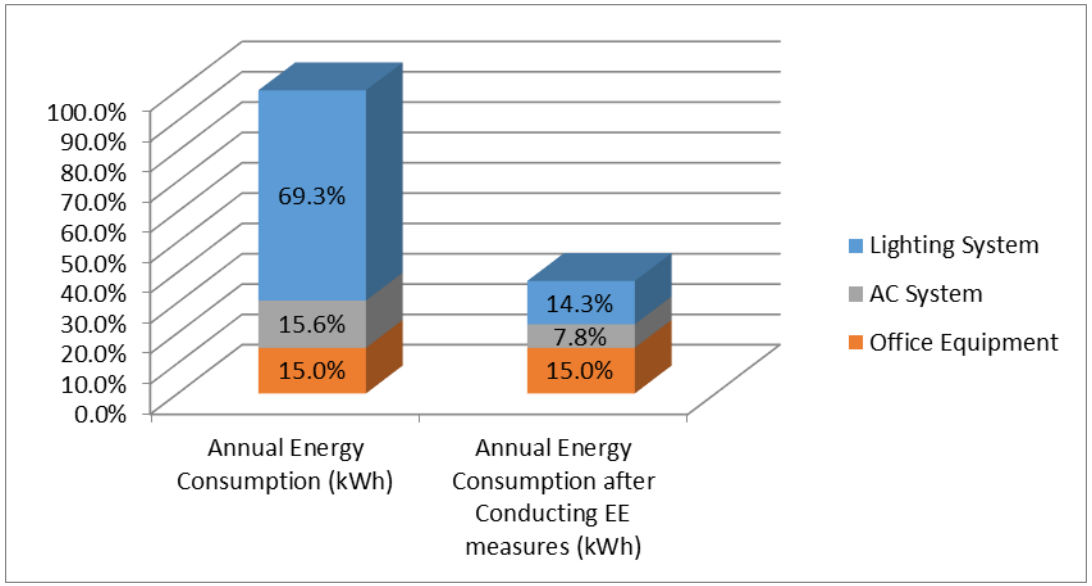
Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	6	0.11	46	3	54	17.73	26
Replacing (CFL lamps 60W) with (LED round panel 18W)	7	0.13	71	5	84	18.01	40
Replacing (Incandescent lamps 100W) with (LED round panel 18W)	41	0.74	807	53	492	9.22	452
Replacing (Flood light Mercury 150W) with (LED Flood light 50W)	2	0.10	67	4	80	18.01	38
Total		1.07	991	65	710	10.8	555

11. Al-Jdaydeh Administrative Building – EE Systems

AC System

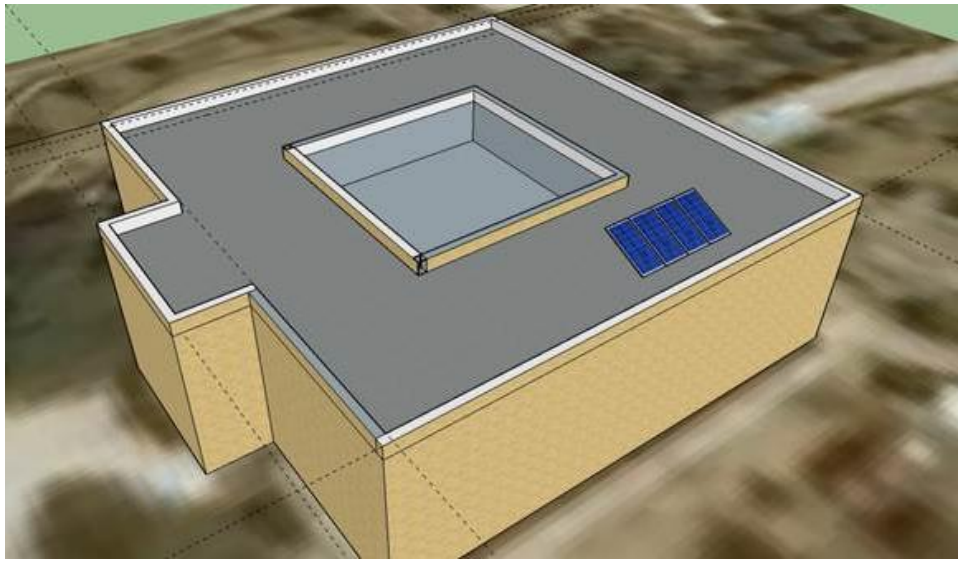
AC's Capacity (Ton)	No.	Total Load (kW)	Total AC Cons. (kWh)	Investment (JOD)	Annual Energy Saving (kWh/yr)	Annual Cost Saving (JOD/yr)	Payback Period (year)
Air Conditioner 1	1	3.51	281	500	141	9	53.6
Air Conditioner 1.5	---						
Air Conditioner 2	---						



11. Al-Jdaydeh Administrative Building –RE systems

PV System

- The total capacity needed to cover the consumption is 1.3 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 2,028 kWh/year
- The energy saving: 100% equivalent to 120 JD/year
- Investment cost is 975 JD and payback period is 8 years

11. Al-Jdaydeh Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Al-Jdaydeh Administrative Building.	50	700.00	49.00	100	150.00	150.00	550.00	38.50	500	13

12. Al-Adnanniya Administrative Building

- EE Systems
- RE Systems

12. Al-Adnanniya Administrative Building – EE Systems

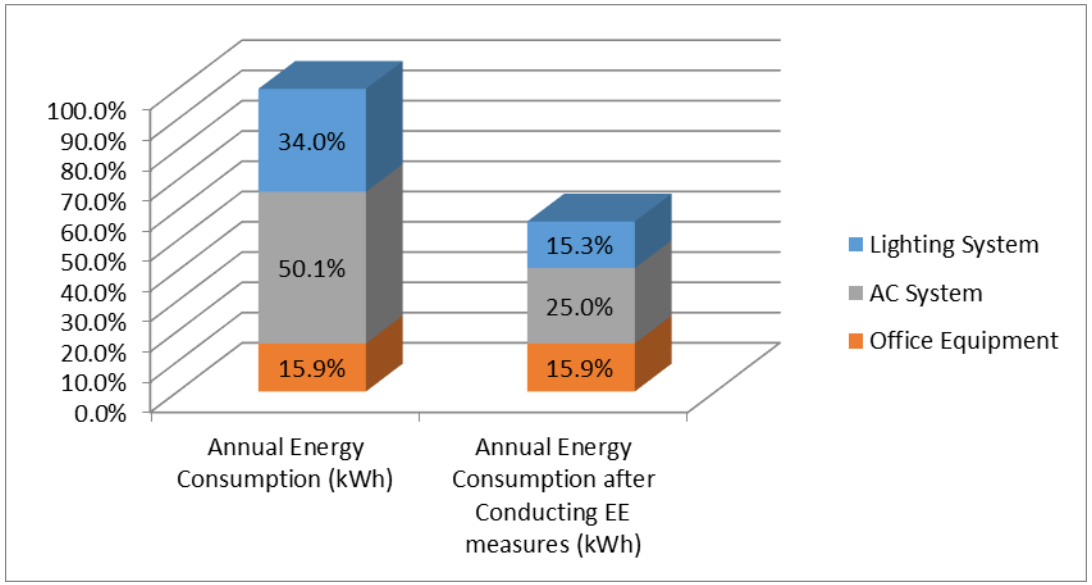
Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	8	0.14	113	8	72	9.25	63
Replacing (CFL lamps 27W) with (LED round panel 18W)	3	0.05	12	1	36	43.87	7
Replacing (CFL lamps 11W) with (LED Bulb 5W)	34	0.17	90	6	408	65.81	50
Replacing (Incandescent lamps 100W) with (LED round panel 18W)	3	0.05	108	7	36	4.82	61
Replacing (Flood light MH 250W) with (LED Flood light 180W)	2	0.36	97	7	300	44.87	54
Total		0.78	419	29	852	29.4	235

12. Al-Adnanniya Administrative Building – EE Systems

AC System

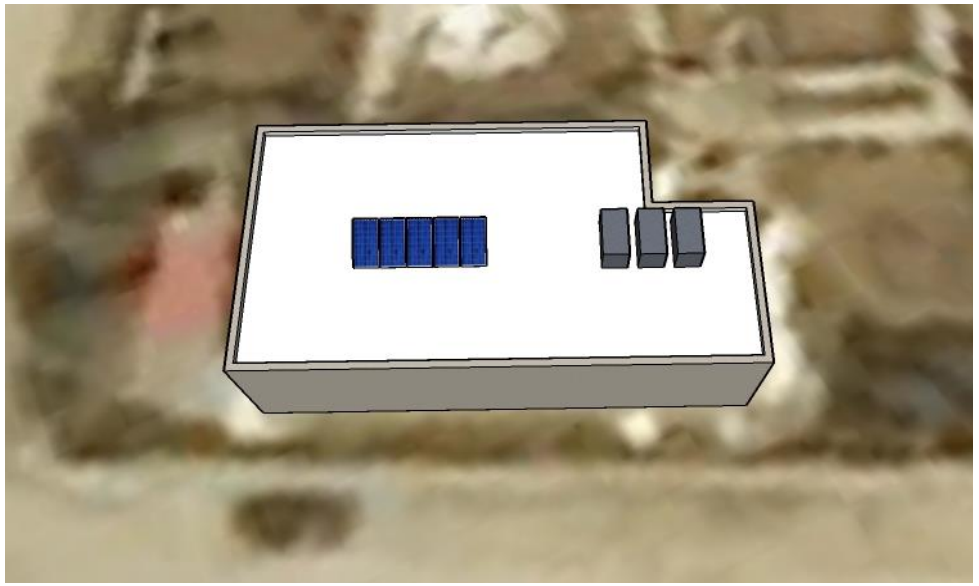
AC's Capacity (Ton)	No.	Total Load (kW)	Total AC Cons. (kWh)	Investment (JOD)	Annual Energy Saving (kWh/yr)	Annual Cost Saving (JOD/yr)	Payback Period (year)
Air Conditioner 1	---	17.57	1124	1900	565	39	48.7
Air Conditioner 1.5	2						
Air Conditioner 2	1						



12. Al-Adnanniya Administrative Building – RE Systems

PV System

- The total capacity needed to cover the consumption is 1.4 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 2,184 kWh/year
- The energy saving: 100% equivalent to 151 JD/year
- Investment cost is 1,050 JD and payback period is 7 years

12. Al-Adnanniya Administrative Building –RE systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Al-Adnanya Administrative Building	50	700.00	49.00	100	150.00	150.00	550.00	38.50	350	9

13. Wadi Al-Karak Administrative Building

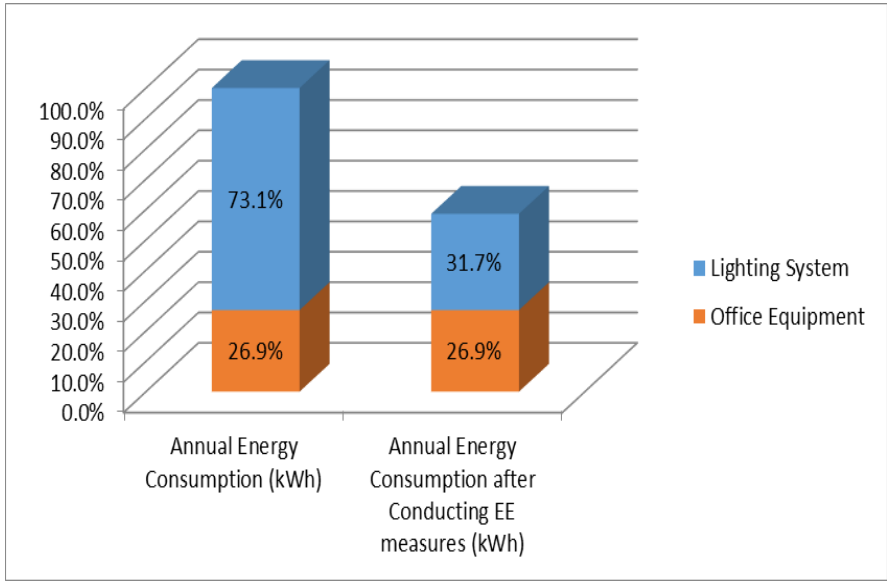
EE Systems

RE Systems

13. Wadi Al-Karak Administrative Building – EE Systems

Lighting System

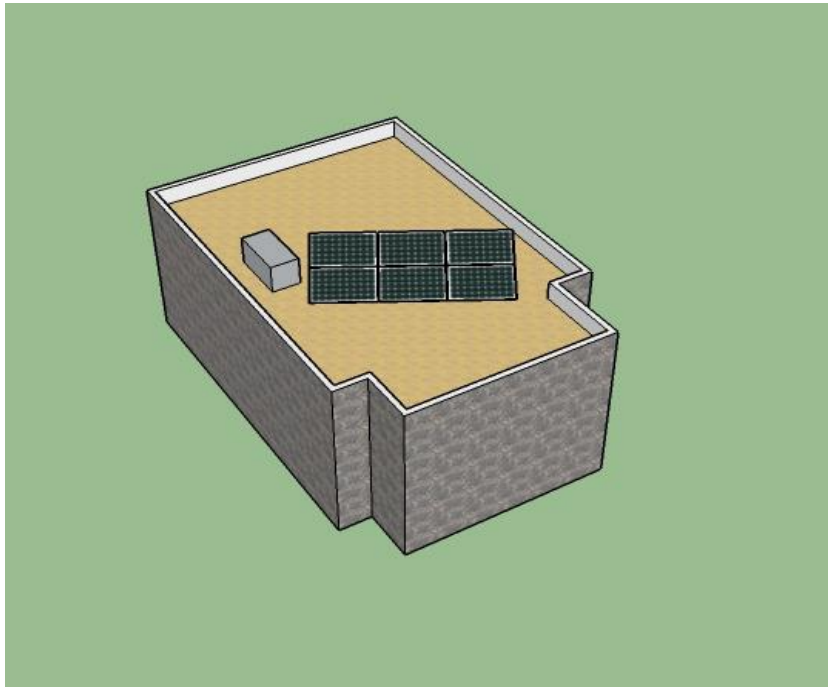
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	20	0.36	819	58	180	3.12	459
Replacing (CFL lamps 27W) with (LED round panel 18W)	3	0.05	35	2	36	14.79	19
Replacing (Flood light MH 250W) with (LED Flood light 180W)	1	0.18	141	10	150	15.13	79
Total		0.59	995	70	366	5.2	557



13. Wadi Al-Karak Administrative Building – RE Systems

PV system

- The total capacity needed to cover the consumption is 1.5 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 2,340 kWh/year
- The energy saving: 100% equivalent to 168 JD/year
- Investment cost is 1,125 JD and payback period is 7 years

13. Wadi Al-Karak Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Wadi Al-Karak Administrative Building.	20	300.00	21.00	100	60.00	60.00	240.00	16.80	500	30

14. Baddan and Barda Administrative Building

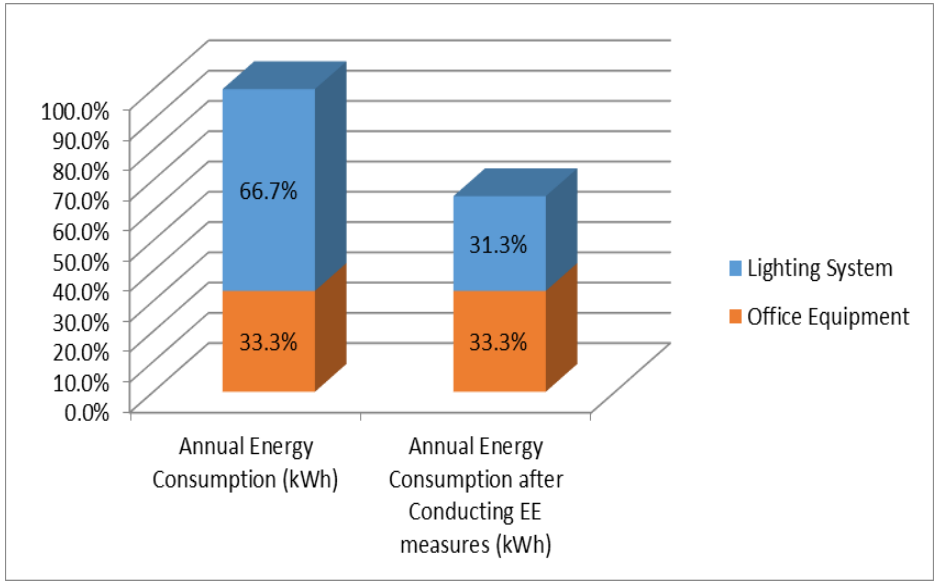
EE Systems

RE Systems

14. Baddan and Barda Administrative Building – EE Systems

Lighting System

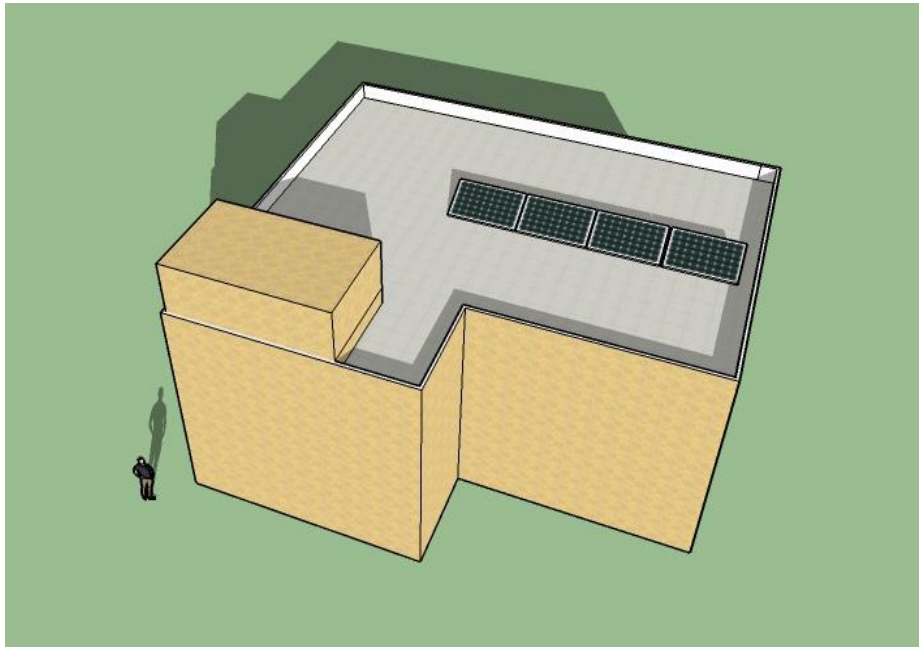
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	8	0.14	410	28	72	2.58	229
Replacing (Flood light MH 250W) with (LED Flood light 180W)	1	0.18	176	12	150	12.49	99
Total		0.32	586	40	222	5.6	328



14. Baddan and Barda Administrative Building –RE systems

PV System

- The total capacity needed to cover the consumption is 1.1 kWp. The available space is sufficient for the required capacity.



- The PV system generates approximately 1,716 kWh/year
- The energy saving: 100% equivalent to 110 JD/year
- Investment cost is 825 JD and payback period is 7.5 years

14. Baddan and Barda Administrative Building – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Baddan & Barda Administrative Building.	50	700.00	49.00	100	150.00	150.00	550.00	38.50	500	13

15. Al-Marj Administrative Building

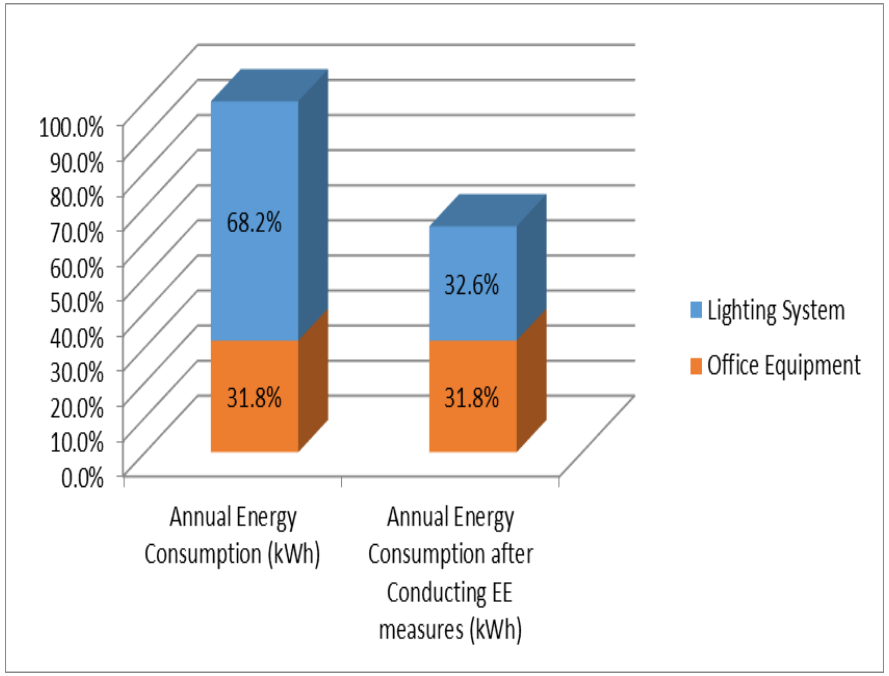
EE Systems

RE Systems

15. Al-Marj Administrative Building – EE Systems

Lighting System

Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	26	0.47	1597	161	234	1.45	895
Replacing (T8 fluorescent linear tube 18W) with (LED tube 9W)	4	0.04	123	12	28	2.25	69
Replacing (CFL lamps 27W) with (LED round panel 18W)	10	0.18	173	17	120	6.87	97
Replacing (Halogen lamps 60W) with (LED round panel 18W)	1	0.02	81	8	12	1.47	45
Replacing (Flood light MH 250W) with (LED Flood light 180W)	3	0.54	634	64	450	7.03	355
Total		1.24	2607	264	844	3.2	1460



15. Al-Marj Administrative Building–RE systems

PV System

- The total capacity needed to cover the consumption is 12.2 kWp. However, the shading caused by the surrounding large trees makes the roof unusable. Therefore, the building has zero potential to install a RE system.

15. Al-Marj Administrative Building–RE systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Al-Marj Administrative Building	50	700.00	126.00	100	150.00	150.00	550.00	99.00	350	4

16. AL-Hawieh Administrative Building

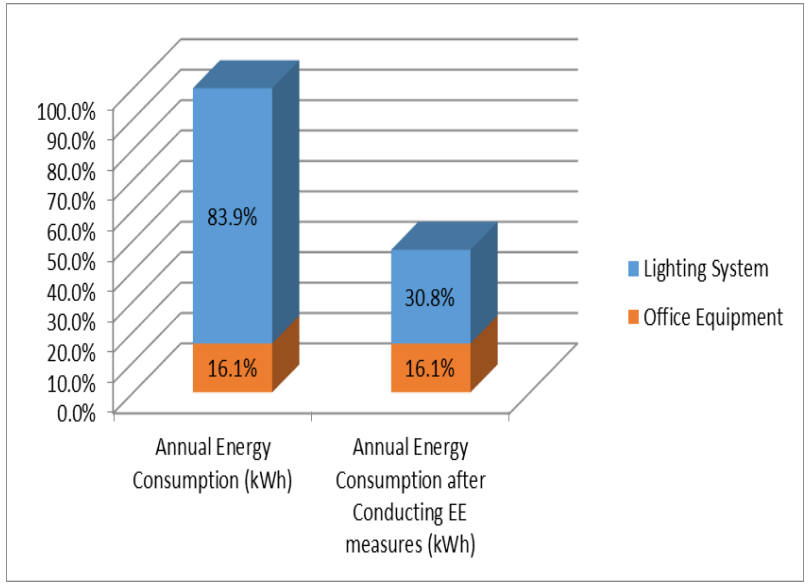
EE Systems

RE Systems

16. AL-Hawieh Administrative Building – EE Systems

Lighting System

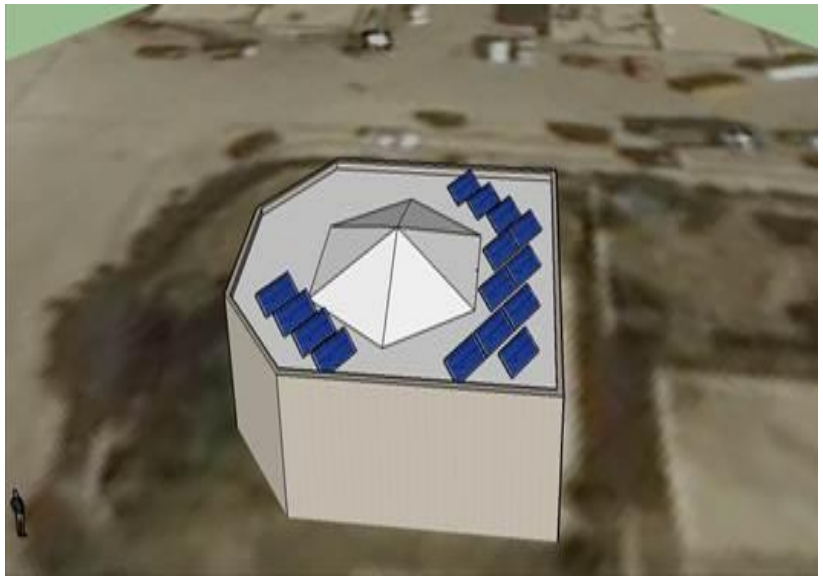
Replacing Lighting Units	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	8	0.14	369	33	72	2.15	206
Replacing (T8 fluorescent linear tube 18W) with (LED tube 9W)	120	1.08	2765	251	840	3.35	1548
Replacing (CFL lamps 27W) with (LED round panel 18W)	3	0.05	39	4	36	10.20	22
Total		1.28	3172	288	948	3.3	1776



16. AL-Hawieh Administrative Building – RE Systems

PV System

- The electrical bills for Al-Hawieh Administrative Building were not available.
- Team estimated the electrical bills based on the electrical loads installed and utilized at the building.
- The total capacity needed to cover the estimated consumption is 3.8 kWp. The available space is sufficient for the required capacity



- The PV system generates approximately 5,600 kWh/year
- The energy saving: 100% equivalent to 542 JD/year
- Investment cost is 2,850 JD and payback period is 5.5 years

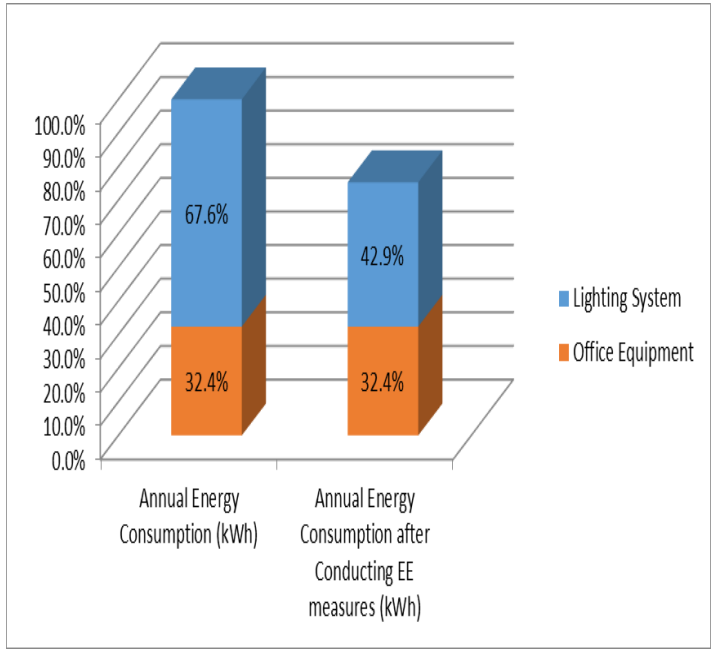
17. Workshop Buildings

- EE Systems
- RE Systems

17. Workshop Buildings – EE Systems

Lighting System

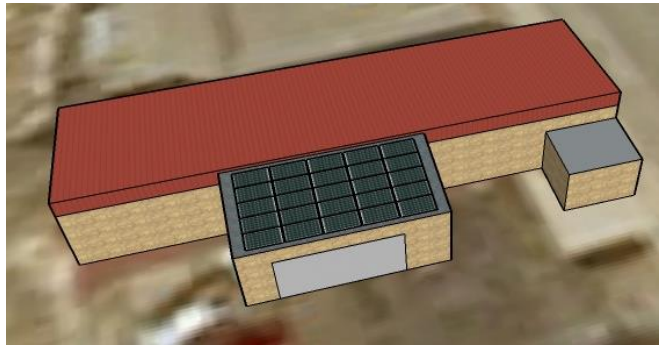
Energy Saving Opportunities	No. of lamps	Total conncected Load (kW)	Annual saving (kWh)	Annual cost saving (JOD)	Investment (JOD)	Simple payback period (yr.)	Expeted CO2 reduction (ton/yr.)
Replacing (T8 fluorescent linear tube 36W) with (LED tube 18W)	7	0.13	412	48	63	1.30	231
Replacing (CFL lamps 60W) with (LED round panel 18W)	4	0.07	309	36	48	1.32	173
Replacing (CFL lamps 27W) with (LED round panel 18W)	7	0.13	116	14	84	6.17	65
Replacing (Flood light MH 250W) with (LED Flood light 180W)	1	0.18	202	24	150	6.31	113
Replacing (Flood light Mercury 150W) with (LED Flood light 50W)	5	0.25	1288	151	200	1.32	721
Total		0.75	2328	273	545	2.0	1303

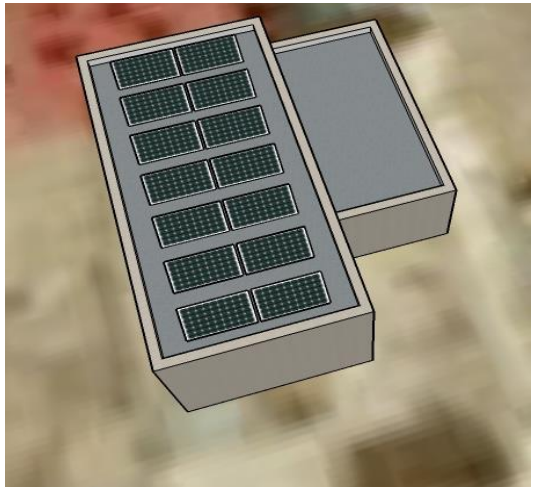


17. Workshop Buildings – RE Systems

PV System

- The total capacity needed to cover the consumption is 6 kWp. The available spaces on the rooftops can fit the required capacity. The owner has the choice to either install building number 1 or building number 2





- The PV system generates approximately 9,360 kWh/year
- The energy saving: 100% equivalent to 1,107 JD/year
- Investment cost is 4,500 JD and payback period is 4 years

17. Workshop Buildings – RE Systems

Solar Water Heating System

Name of Building	Existed System capacity (Gazer) (lit/day)	Annual Electricity energy (KWh)	Annual Electricity consumption cost (JD/yr)	Solar Hot water Capacity(Lit /day)	Solar Hot water(KWh)	Total (KWh)	Annual energy Saving (KWh)	Annual cost Saving (JOD)	Solar Hot water cost (JD)	Payback (yr)
Workshop Buildings.	30	400.00	48.00	100	60.00	60.00	340.00	40.80	500	12

Let us Think together for a Change

نفكر معاً من أجل التغيير نحو تنمية مستدامة

Thank you

MINARET

Team