



ASSESSING THE SOCIO-ECONOMIC IMPACTS OF LOCAL COMMUNITIES ON RESOURCES USE, MANAGEMENT AND SUSTAINABILITY USING THE NEXUS APPROACH



This report was prepared in accordance to the consultancy service performed for the MINARET project. The aim of this study is to conduct a socio-economic study in three municipalities which are Karak Municipality in Jordan, Jdeidet Al-Chouf in Lebanon and Monastir in Tunisia.



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List of Acronyms (in alphabetical order)

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|------------------|--|
| BMZ | German Federal Ministry for Economic Cooperation and Development |
| CSP | Concentrated Solar Power |
| EKF-ESS | Sustainable use of ecosystem services in Jordan – Energy and Climate Fund |
| FAO | Food and Agriculture Organization |
| FPEC | Future Pioneers for Empowering Communities |
| JOHUD | The Jordanian Hashemite Fund for Human Development |
| INS | National Institute of Statistics |
| IUCN ROWA | International Union for Conservation of Nature\ Regional Office of West Asia |
| MENA | Middle East and North Africa region |
| MINARET | MENA Region Initiative as a model of the NEXUS Approach to Renewable Energy Technologies project |
| NERC | National Energy Research Center |
| NEXUS | The term used in this report refers to Energy, Water and Food |
| NGOs | Non-governmental Institutions |
| NREAP | National Renewable Energy Action Plan |
| OECD | Organization for Economic Co-operation and Development |
| ONAS | Office National de l'Assainissement |
| PV | Solar Photovoltaic |
| RE | Renewable Energy |
| RSS | Royal Scientific Society |
| SDGs | UN Sustainable Development Goals |
| SIDA | Swedish International Development Cooperation Agency |
| SPSS | Statistical Package for the Social Sciences |
| UNHCR | United Nations High Commissioner for Refugees |

Executive Summary

The NEXUS, or interlinkages among water, energy and food supply systems, is a major consideration in countries' sustainable development strategies. Demands over NEXUS are on the rise due to the population expansions, rapid economic growth and increasing wealth. It is estimated that the demand for energy will almost double globally, with water and food demands estimated to increase by over 50% by 2050. The limited available resources, climate changes as well as the challenges over resources allocation are threatening the ability of existing water, energy and food systems to be sustained. Therefore, policymakers are concerned about nexus as means for improving water, energy and food security.

This report was prepared as part of the MINARET project, with the aim to conduct a detailed socio-economic study in these three municipalities: Karak (Jordan), Jdeidet Al-Chouf (Lebanon) and Monastir (Tunisia). The MINARET Project was developed based on a success story of a related project which had enhanced and strengthened knowledge and awareness of the importance of the use of renewable energy and energy efficiency technologies in households and financial activities to assist in attaining sustainable development. The project adopted a bottom up approach which made use of community views to influence policies and act as agents of change, supporting local communities, authorities, and civil society in alleviating poverty, enhancing livelihoods and empowering vulnerable and marginalized groups. Considering the unique nature of each community, the MINARET project will also help to establish a regional platform for communications, and sharing of knowledge, policies, practices, experiences and expertise on both the municipalities and households' levels. Moreover, the project's vision is to assist municipalities in becoming members of the Covenant of Mayors, demonstrating their commitment and capabilities in achieving the environmental governance goals and set targets.

A good number of municipalities in various MENA countries are already progressing in this direction due to the importance of the Sustainable Development Goals (SDGs); hence the project was developed to ensure that the socio-economic surveys were designed and complied to serve those objectives, thereby articulating the relationship between the investments reported from each of the three municipalities and their respective impact goals.

The NEXUS approach which factors in the interlinkages and synergies among water, energy and food supply systems, was adopted to accent understanding and lead countries towards attaining sustainable development through reduced reliance on imported fossil fuels despite limited availability of resources. With increased population, economic growth and expenditures, as well as increased demands for resources such as water and energy, there is the crucial need to firstly assess how communities utilize resources, and find ways to conserve resources as well as finding alternatives to meet the growing demands. It is estimated that energy and food demands will almost double globally within the next 30 years. However, supply to meet such demands will be severely impacted as a result of limitations of those resources, climate change, natural and anthropogenic stressors, pressures and inequality in

the world's wealth and resource distribution. Water, fossil fuels and food can be classified as finite resources, if not conserved and used sustainably. Using the NEXUS approach to influence policy making and educate consumers on the need for sustainable use and management of the resources, may help to reduce the threats and allow resources to be effectively sustained.

A detailed socio-economic study was designed to understand communities' understanding and perceptions about the sustainable use of resources such as water and energy and their implications on food production and security. Using the NEXUS approach, a set of methodologies, inclusive desktop reviews of existing information to establish baselines, were developed and applied in the three project sites. Structured questionnaires targeting households, governmental and non-governmental institutions of the three municipalities were used to collate new information as part of the study.

Additionally, focus groups, taking into account age and gender, assisted the study by providing additional relative and crucial information. This project was made possible following the generous support of the Swedish International Development Cooperation Agency (SIDA), through the Swedish Development Cooperation in the Middle East and North Africa (MENA), led by the Royal Scientific Society / National Energy Research Center (RSS/NERC) in partnership with the International Union for Conservation of Nature / Regional Office of West Asia (IUCN ROWA) and Future Pioneers for Empowering Communities (FPEC).

Results of the study highlighted that the family size in all targeted municipalities ranged between 1-9 individuals, according to national statistics, which is considered rather high. In Karak Municipality, the average family size was found to be 5.09, which is slightly higher than the national average in Jordan, recorded at 4.8. The family size in Jdeidet Al-Chouf is 3.92, which is lower than the national level, recorded at 4.3, while it was found in Tunisia to be 3.84 and very close to the national statistics, recorded at 4.1. These high values directly affect family needs and demands on resources such as energy, food and water; consequently, this call for urgent and direct interventions using the nexus approach, accented by numerous awareness programs on supporting the nexus approach.

This study showed that all three surveyed countries depicted a young age population composition, which was equally distributed between both genders. The majority of the population in Karak Municipality fell within the young age structure, between 11-30 years of age at 51.3%. The same age group percentage proved to be lower in Lebanon at 35.9% of the total population and the highest recorded. In the case of Tunisia, higher values for the same young age group were recorded, at 45.8% of the total population. Furthermore, an equal gender opportunities approach in terms of higher education (postgraduate / universities studies) was reported in Jordan and Lebanon, but not in Tunisia that reflected very low percentages of the population who pursued university education compared to high schools and community colleges; yet there were consistencies in educational opportunities between males and females on all literacy levels.

Results from the survey illustrated that the majority of houses (>75%) in all three surveyed municipalities were owned by the household head. Housing ownership was extremely important since it can contribute to sustainable interventions on the household level, better management, monitoring, planning and development. It was found out that the income was always insufficient in Karak Municipality and always sufficient in both Jdaidet Al-Chouf and Monastir Municipalities.

This survey showed that 91.4% of households depend on electricity and gas as major sources of energy in Karak and Jdeidet Al-Chouf Municipalities. An average of the monthly costs of energy bills of 53.15 US\$ was recorded in Karak, versus 107.29US\$ and 30.57\$ in Jdeidet Al-Chouf and Monastir respectively. It was also found that people are highly reliable on electricity and gas for most of their energy needs, at 90.4%, compared to solar energy use, which accounted for only 3.1% of the total households' dependency.

Despite the limited number of households that own agricultural land, it was highlighted by the survey that the majority of landowners in Karak Municipality (55.6%) relied on solar energy as a major energy source for lighting and operating agricultural equipment. The situation in Jdeidet Al-Chouf in Lebanon was different, since no adoption of solar power was recorded in agricultural and irrigation (pumps) activities. The Tunisian experience in Monastir were very similar to Jdeidet Al-Chouf whereby the absence of solar energy usage in agricultural activities or irrigating pumps was observed. The majority of households used mostly electricity as their main energy source, at 59.1%, to operate agricultural equipment and for lighting. They also made use of diesel and gasoline which constituted 13.6% and 22.7% of the total households dependency, respectively.

The results indicated that a monthly cost of 29.45 US\$ was incurred on the households level for water in Karak Municipality in Jordan, which means that the population was heavily reliant on the public grid as the main source of water, followed by filtered water. In Jdeidet Al Chouf, the basic sources of water were from the public grid followed by filtered water, coupled with the use of spring water and tanks. The Monastir municipality in Tunisia made better use of water harvesting as compared to Karak and Jdeidet Al-Chouf - but it has not yet achieved the required demand level. The majority of households are depended on the public grid and filtered water for their water supply.

During the study, the consultant interviewed households in the three targeted municipalities to understand their preferred and available energy sources. It was clear that people on the level of households preferred electricity, especially in Jordan and Tunisia, while this energy source was ranked second, after wood in Lebanon which was their most desirable energy source. Results showed that people in households in all targeted municipalities for this study, did not have preference regarding the use of solar energy. Although Tunisia showed better response to the use of solar energy, this energy source was ranked third with regards to understanding households' perception on water saving, it was found that the majority of households within the studied municipalities were willing to save water. Similar results were obtained for energy saving as the key means to firstly secure financial saving and for nature conservation purposes.

Key governmental and non-governmental institutions within each municipality were listed and services provided by each municipality were illustrated. This was combined with a detailed description of small-scale initiatives that can be applied in each municipality in order to support the MINARET project by upscaling their projects and providing direct interventions that will contribute to the NEXUS approach. After analysing all details and based on the proposed activities, the consultant concluded that this project will contribute significantly to the Sustainable Development Goal 17 “**SDG 17: Partnership for the Goal**” in addition to the reported SDGs in the project document. The contribution in SDG 17 shall include the four sections which are:

1. **Finance** and includes SDG 17.1 entitled “Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection”, SDG 17.3 which state “Mobilize additional financial resources for developing countries from multiple sources” and SDG 17.5 which state “Adopt and implement investment promotion regimes for least developed countries”.
2. **Technology** and includes 17.6 “Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level and through a global technology facilitation mechanism” and 17.7 “Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed”.
3. **Capacity Building** and includes 17.9 “Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation”.
4. **Systematic Issues** and include 17.16 “Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries” and 17.17 “Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships”.

بدأ مفهوم النيكسوس (NEXUS) أو الترابط بين نظم إمدادات المياه والطاقة والغذاء بالانتشار ويعتبر عامل رئيسي في استراتيجيات التنمية المستدامة للدول. يزداد الطلب على هذا المفهوم بسبب تسارع التوسع السكاني والنمو الاقتصادي وزيادة الثروات، بضوء التوقعات بزيادة الطلب على الطاقة بمقدار الضعف تقريباً على الصعيد العالمي، حيث تقدر الزيادة في الطلب على المياه والغذاء بنسبة 50 في المائة بحلول عام 2050. كما أن محدودية الموارد المتاحة والتغير المناخي، فضلاً عن التحديات المتعلقة بتخصيص الموارد، تهدد المخزون المائي الحالي واستدامة نظم الطاقة والغذاء. ولذلك، ادرك صناع السياسات ضرورة تحسين الترابط والروابط بين قطاعات المياه والطاقة والأمن الغذائي.

بدأت مبادرة منطقة الشرق الأوسط وشمال أفريقيا كنموذج لمشروع نهج تقنيات الطاقة المتجددة (نيكسوس) من أجل التغلب على التحديات المترابطة على الموارد من خلال اعتماد نهج يعزز التأزر بين تقنيات الطاقة المتجددة وكفاءتها وإدارة المياه والأمن الغذائي وضمان استدامة هذه العناصر. وقد تم تطوير مشروع ميناريت (MINARET) استناداً إلى قصة النجاح تحققت في بلدية سحاب في الأردن، والتي عززت الوعي والمعرفة بأهمية استخدام الطاقة المتجددة وكفاءة استخدام الطاقة.

سيتم تنفيذ المشروع في ثلاثة دول، وعلى مستوى البلديات وهي بلدية "الكرك" في الأردن وبلدية "جديدة الشوف" في لبنان وبلدية "المونستير" في تونس. ولذلك، تم إعداد دراسة اجتماعية اقتصادية مفصلة، صُممت لفهم تصورات المجتمع تجاه استخدام الموارد المستدامة مثل الطاقة والمياه، وأثارها على قضايا الأمن الغذائي. تمت الموافقة على مجموعة من الأساليب التي تراعي منظور النوع الاجتماعي (الجنس)، بحيث يتم تطبيقها بالتساوي داخل البلديات الثلاث. وشملت الطرق مراجعة مكتبية مفصلة للمعلومات المتوفرة حول كل بلدية. بالإضافة إلى ذلك، فقد تم إعداد استبيان منظم يستهدف الأسر والمؤسسات التي تقع داخل حدود كل بلدية. وأخيراً، تم تنفيذ مجموعات من خلال تمويل مقدم من الوكالة السويدية للتعاون الإنمائي الدولي (سيدا)، من خلال التعاون الإنمائي السويدي في منطقة الشرق الأوسط وشمال أفريقيا بقيادة وتوجيه الجمعية العلمية الملكية / المركز الوطني لبحوث الطاقة وبشراكة مع الاتحاد الدولي لحماية الطبيعة/ المكتب الإقليمي لغرب آسيا ومؤسسة رواد المستقبل لتمكين المجتمعات.

سيتم تنفيذ المشروع في ثلاث بلديات تقع في ثلاثة دول وهي الأردن ولبنان وتونس ومن أجل ذلك، تم إعداد دراسة اجتماعية اقتصادية مفصلة وتصميمها لفهم تصورات المجتمع تجاه استخدام الموارد المستدامة مثل الطاقة والمياه، وأثارها على قضايا الأمن الغذائي. تم تنفيذ مجموعة من الأساليب وتطبيقها بالتساوي داخل البلديات الثلاث، شملت المراجعات المكتبية لمجمع المعلومات على مستوى كل بلدية، بالإضافة إلى تنفيذ استبيان يستهدف الأسر والمؤسسات التي تقع داخل حدود كل بلدية. وأخيراً، تم تنفيذ مجموعات التركيز التي تستهدف ثلاث مجموعات رئيسية.

أظهرت النتائج أن معدل حجم الأسرة في جميع البلديات المستهدفة يتراوح ما بين 1 - 9، وهو ما يعتبر رقماً مرتفعاً مع أنه يتماشى مع الإحصاءات الوطنية لكل دولة ويعود ذلك إلى طبيعة تركيب الاسر في المنطقة العربية. بلغ حجم الأسرة في بلدية الكرك 5.09، وهو أعلى بقليل من متوسط حجم الأسرة في الأردن الذي بلغ 4.8. ويبلغ حجم الأسرة في جديدة الشوف 3.92، وهو أقل من المستوى الوطني الذي بلغ 4.3، بينما وجد في تونس 3.84، وهو قريب جداً من الإحصاءات الوطنية المسجلة في تونس وهي 4.1. وتؤثر أحجام الأسر الكبيرة تأثيراً مباشراً على زيادة مطالب الأسرة على الموارد مثل الطاقة والغذاء والماء، مما سيحتاج بالتالي إلى تدخلات مباشرة وبرامج توعية حول نهج نيكسوس.

أظهرت هذه الدراسة أيضاً مراحل عمرية يافعة في جميع الدول التي شملتها الدراسة، والتي توزع بالتساوي بين الذكور والإناث. غالبية السكان في بلدية الكرك لديها بنية عمرية فتية تتراوح بين 11-30 سنة وبلغت 51.3%، وهي أقل في لبنان لذات الفئة العمرية التي بلغت 35.9%، لكنها لا تزال الأعلى، في حين تم الحصول على قيم أعلى للأعمار الشابة في تونس وتمثل 45.8%. وبالإضافة إلى ذلك توجد فرص متساوية بين النوعين الاجتماعيين في قطاع التعليم العالي (أي الجامعات والدراسات العليا) في الأردن ولبنان. أظهرت الدراسة أن التعليم الجامعي لم يكن بذات القدر في تونس ويحتل نسبة أقل بسبب تفضيل الكليات المجتمعية وغيرها، لكن هناك اتساق في الفرص التعليمية بين الذكور والإناث (في تونس) أيضاً.

أظهر الاستطلاع أن غالبية المنازل (أكثر من 75 في المائة) في جميع البلديات المشمولة بالمسح مملوكة لرئيس الأسرة. وتكتسب ملكية المساكن أهمية قصوى لأنها يمكن أن تساهم في التدخلات المستدامة على مستوى الأسرة والمعيشية، وتحسين الإدارة والتخطيط والرصد. كما تبين أن الدخل غير كاف دائماً في بلدية الكرك لكنه دائماً كافٍ في بلديتي جديدة الشوف والمونستير. أظهرت هذه الدراسة أن 91.4% من الأسر تفضل مصدر الكهرباء والغاز كمصدرين رئيسيين للطاقة في بلديات الكرك وجديدة الشوف حيث بلغ متوسط التكاليف الشهرية لفواتير الطاقة 53.15 دولاراً أمريكياً في الكرك مقابل 107.29

دولار و30.57 دولار في كل من جديدة الشوف والمونستير، بالترتيب. كما وجد أن الناس يعتمدون بدرجة عالية على الكهرباء والغاز لمعظم احتياجاتهم من الطاقة (90.4%)، مع استخدام منخفض جدا للطاقة الشمسية التي تشكل 3.1% فقط.

وعلى الرغم من أن عدد الأسر تمتلك اراضي زراعية إلا أن غالبية مالكي الأراضي في بلدية الكرك (55.6%) هم الذين يستخدمون الطاقة الشمسية كمصدر رئيسي للطاقة في الاضاءة وتشغيل المعدات الزراعية. بينما يختلف الوضع في جديدة الشوف في لبنان حيث لم يتم تسجيل أي اعتماد على الطاقة الشمسية في الأنشطة الزراعية ومضخات الري. والتجارب التونسية في بلدية المونستير مشابهة جداً لتلك الموجودة في جديدة الشوف في لبنان. وبشكل عام فإن غالبية الطاقة المستخدمة هي الكهرباء (59.1%)، والتي تستخدم لتشغيل المعدات الزراعية والاضاءة، لكن يتم استخدام الديزل والبنزين أيضا بنسب 13.6% و22.7% على التوالي.

أشارت النتائج إلى أن تكلفة شهرية قدرها 29.45 دولار أمريكي تدفع على مستوى الأسرة في بلدية الكرك في الأردن لقاء الماء. ويعتمد السكان بشكل كبير على الشبكة العامة كمصدر رئيسي للمياه، تليها المياه المفطرة. أما في جديدة الشوف؛ فإن المصادر الأساسية للمياه هي الشبكة العامة تليها المياه المفطرة، مع استخدام ملحوظ لمياه الينابيع بينما تستخدم بلدية المونستير في تونس حصاد المياه بطريقة أفضل إذا ما قورنت بالكرك أو جديدة الشوف، لكنها لم تصل إلى المستوى المطلوب بعد، حيث أن التبعة الرئيسية تقع على الشبكة العامة والمياه المفطرة.

أجرى الخبير الاستشاري مقابلات مع الأسر داخل البلديات الثلاث التي استهدفت فهم تفضيلاتها تجاه موارد الطاقة المتاحة. وكان من الواضح أن الناس على مستوى الأسرة يفضلون الكهرباء، وخاصة في الأردن وتونس، في حين أن مصدر هذه الطاقة هو الثاني، بعد الخشب الذي أظهر أنه مصدر مرغوب فيه للطاقة في لبنان. وأظهرت النتائج أن الأشخاص في الأسر المعيشية في جميع البلديات لا يفضلون الطاقة الشمسية. وعلى الرغم من أن تونس أظهرت مستوى أفضل، إلا أنها لا تزال الثالثة في التفضيلات. وعندما سئل الناس من جميع البلديات التي تمت دراستها عن توفير المياه، استقرت الأغلبية على استعدادهم لتوفير المياه. وكانت النتائج مماثلة تقريبا للأسباب الكامنة وراء توفير الطاقة، حيث كان الادخار المالي هو السبب الرئيسي، تليها أسباب الحفاظ على الطبيعة.

وقد تم إدراج المؤسسات الحكومية وغير الحكومية الرئيسية في كل بلدية، كما تم توضيح الخدمات التي تقدمها كل بلدية. وقد تم ضم ذلك إلى وصف مفصل للمبادرات الصغيرة التي يمكن تطبيقها في كل بلدية من أجل دعم مشروع ميناريت في توسيع نطاق مشروعهم، وتقديم تدخلات مباشرة داخل كل حدود البلدية التي من شأنها أن تساهم في نهج نيكسوس. بعد تحليل جميع التفاصيل، واستنادا إلى الأنشطة المقترحة؛ خلص الخبير الاستشاري إلى أن هذا المشروع سيسهم إسهاما كبيرا في الهدف 17 من أهداف التنمية المستدامة "الشراكة من أجل تحقيق الهدف" بالإضافة إلى أهداف التنمية المستدامة التي تم توثيقها في وثيقة المشروع. وتتضمن المساهمة في الهدف 17 من أهداف التنمية المستدامة كل مما يلي:

1. التمويل ويشمل الهدف 17.1 من أهداف التنمية المستدامة الذي ينص على "تعزيز تعبئة الموارد المحلية، بما في ذلك من خلال الدعم الدولي المقدم إلى البلدان النامية، من أجل تحسين القدرة المحلية على تحصيل الضرائب وغيرها من الإيرادات"، بالإضافة إلى 17.3 والذي ينص على "تعبئة موارد مالية إضافية للبلدان النامية من مصادر متعددة" والغاية 17.5 من أهداف التنمية المستدامة التي تنص على "اعتماد وتنفيذ نظم تشجيع الاستثمار لأقل البلدان نمواً".
2. التكنولوجيا وتشمل 17.6 "تعزيز التعاون بين الشمال والجنوب وبين بلدان الجنوب والتعاون الثلاثي والدولي بشأن العلم والتكنولوجيا والابتكار والوصول إليها وتعزيز تبادل المعارف بشروط متفق عليها بصورة متبادلة، بما في ذلك من خلال تحسين التنسيق فيما بين الآليات القائمة، على مستوى الأمم المتحدة، ومن خلال آلية عالمية لتيسير التكنولوجيا"، و17.7 "تشجيع تطوير ونقل ونشر التكنولوجيات السليمة يبنيا إلى البلدان النامية بشروط مواتية، بما في ذلك الشروط التساهلية والتفضيلية، على النحو المتفق عليه بصورة متبادلة".
3. بناء القدرات ويشمل 17.9 "تعزيز الدعم الدولي لتنفيذ بناء القدرات الفعال والمستهدف في البلدان النامية لدعم الخطط الوطنية لتنفيذ جميع أهداف التنمية المستدامة، بما في ذلك من خلال التعاون بين الشمال والجنوب والتعاون فيما بين بلدان الجنوب والتعاون الثلاثي".
4. المسائل المنهجية وتشمل 17.16 "تعزيز الشراكة العالمية من أجل التنمية المستدامة، التي تكملها الشراكات بين أصحاب المصلحة المتعددين التي تقوم بتعبئة وتقاسم المعارف والخبرات والتكنولوجيا والموارد المالية، لدعم تحقيق أهداف التنمية المستدامة في جميع البلدان، البلدان النامية" و17.17 "تشجيع وتعزيز الشراكات الفعالة بين القطاعين العام والخاص والمجتمع المدني، والاستفادة من الخبرة المكتسبة واستراتيجيات توفير الموارد للشركاء".

Chapter One: Introduction

1.1 The Water-Energy-Food NEXUS Approach

A direct link exists between water, energy and food systems (Figure 1). This connection peaks during economic growth, increased wealth and population expansion. Such factors are perceived as the major drivers for increased demand on energy, water and food supply. Estimations indicate that the demand on energy will be doubled by 2050, while water and food demands will be increased by over 50% over the same period of time. Access to resources and wealth have not been equitable worldwide and country-wide, according to the Food and Agriculture Organization (FAO) Report of 2013, about 1.2 billion people of the global population still lack access to electricity. Furthermore, 783 million people lack the means to access clean water resources. Additionally, the report highlighted that around 842 million people suffer from chronic starvation.

Meeting the growing global demand on energy, water and food resources is becoming more challenging. Growing reliance on conventional energy is escalating environmental costs and concerns. Moreover, it further increases vulnerability to price instability.

Water is essential for extracting, processing and refining fossil fuel, as well as for generating electricity. At the same time, energy plays a vital role in pumping, moving, distributing and treating water. Furthermore, energy and water are crucial inputs for food production, processing, transport and preparation. The agri-food chain accounts for around 30% of the world's energy consumption and agriculture is the planet's largest consumer of water resources, accounting for 80-90% of all freshwater use (Hoff, 2011). Therefore, an approach of NEXUS has been developed which entitles dealing with energy and water supplies and demands and their implications on food security. This concept is the base of the MINARET project.



Figure 1: NEXUS

1.2 The MINARET Project

1.2.1 Overview

Countries in the (MENA) region are witnessing increasing challenges, including but not limited to, growing demands on limited resources, population expansions, high unemployment rates and the significant influx of refugees especially into Jordan, Lebanon and Tunisia. These challenges have extremely affected natural resources availability, particularly water and has directly affected these countries national economies, particularly in light of their high dependency on fuel as a major source of energy.

Therefore, the MENA Region Initiative as a model of the NEXUS Approach to Renewable Energy Technologies (MINARET) project was initiated to overcome the increasing challenges over resources, through the adoption of an approach that strengthen synergies between renewable energy technology and efficiency, water management and food security, thereby ensuring long- term sustainability. The MINARET project was developed based on a success story achieved in Sahab Municipality in Jordan, which had enhanced and strengthened the awareness and knowledge on the importance of using renewable energy and energy efficiency technologies.

The MINARET project adopted a bottom-up approach counting on the local communities' engagement as agents of changes. Furthermore, the project assisted and supported local authorities and civil society in reducing poverty, improving living conditions and empowering local community groups, women, youth and other marginalized groups. Considering the unique nature of each community, the MINARET project also helped to establish a regional platform for communication and knowledge sharing, policies, practices, experiences and expertise at both municipalities and household levels. Moreover, the project's vision was to assist municipalities in becoming members of the Covenant of Mayors, demonstrating their commitment and capability of meeting the environmental governance goals and impact the targets of such organization; a number of municipalities in various MENA countries are already progressing towards this membership.

Globally, energy use, management and alternatives have been debated in national policies for several years as more and more countries diversify their energy source options as a way of reducing reliance on the exhaustible fossil fuel which pose severe detrimental environmental impacts as well as economic pressures. The use of green energy technology has been in the limelight, securing funding from international organizations and other related parties to improve energy technology and adopt greener practices for long term social, environmental and financial benefits.

1.2.2 The MINARET and the Sustainable Development Goals (SDGs)

The UN Sustainable Development Goals (SDGs)¹ were adopted in September 2015 by the 2030 Agenda for Sustainable Development. SDGs aim to set the world on a path towards sustainable development and include 17 SDGs, representing cross-cutting objectives targeting the social, economic and environmental dimensions of sustainable development. The SDGs build on the success of the Millennium Development Goals (MDGs) which concluded at the end of 2015 and focused on the most vulnerable populations and address extreme poverty, hunger, disease, gender equality, education and environmental sustainability.

Due to the position of SDGs at national level, the MINARET project embraces five of these SDGs to be considered over the duration of project implementation. This includes “**SDG5: Gender equality**”², which includes empower women and girls to reach their full potential, which requires eliminating all forms of discrimination and violence against them, including harmful practices. It seeks to ensure that they have every opportunity for sexual and

¹ <https://sustainabledevelopment.un.org/sdgs>

² <https://sustainabledevelopment.un.org/sdg5>

reproductive health and reproductive rights, receive due recognition for their unpaid work, have full access to productive resources and enjoy equal participation with men in political, economic and public life.

“SDG 6: Clean water and sanitation”³ was also considered in the MENARET project, where Goal 6 goes beyond drinking water, sanitation and hygiene to also address the quality and sustainability of water resources. Achieving this Goal, which is critical to the survival of people and the planet, means expanding international cooperation and garnering the support of local communities in improving water and sanitation management. The project will also contribute to **“SDG7: Energy”**⁴ which will ensure access to affordable, reliable, sustainable and modern energy for all. Also, it seeks to promote broader energy access and increased use of renewable energy, including through enhanced international cooperation and expanded infrastructure and technology for clean energy.

“SDG 11 Sustainable cities and communities”⁵ is also tackled and aimed to renew and plan cities and other human settlements in a way that fosters community cohesion and personal security while stimulating innovation and employment. Lastly, the project shall contribute to **“SDG13: Climate action”**⁶ since Climate change presents the single biggest threat to development and its widespread, unprecedented effects disproportionately burden the poorest and the most vulnerable. Urgent action is needed not only to combat climate change and its impacts, but also to build resilience in responding to climate-related hazards and natural disasters (Figure 2).



Figure 2: SDGs targeted within the MINARET project

Due to the importance of the SDGs, the project was developed to ensure that the socio-economic surveys will comply to these objectives, thereby articulating the relationship between the investments reported from each of the three municipalities and their impact goals.

1.2.3 Funding Entity

The MINARET project was able to materialise following the generous support from the Swedish International Development Cooperation Agency (SIDA), through the Swedish Development Cooperation in the Middle East and North Africa (MENA) region⁷. The Swedish

³ <https://sustainabledevelopment.un.org/sdg6>

⁴ <https://sustainabledevelopment.un.org/sdg7>

⁵ <https://sustainabledevelopment.un.org/sdg11>

⁶ <https://sustainabledevelopment.un.org/sdg13>

⁷ <http://www.swedenabroad.com/en-GB/Embassies/Amman/Development-Cooperation/Regional-Cooperation-Programme-for-the-Middle-East-and-North-Africa/>

support to the MENA region shall, be concentrated to three areas of cooperation according to the strategy and these are:

1. Strengthened democracy and gender equality and greater respect for human rights.
2. Environmental improvement, reduced climate impacts and increased resilience to environmental impacts, climate change and natural disasters (with a focus on transboundary water resources).
3. Improved opportunities for regional economic development as a prerequisite for enabling poor people to improve their living conditions.

The MENA strategy of SIDA will be implemented between 2016 and 2020 with a budget of 216 MUSD.

1.2.4 Implementing Entities

This project was led by the Royal Scientific Society/National Energy Research Center (RSS/NERC). This centre is considered a specialized technical centre of the RSS and was established for the purposes of research, development and training in the fields of new and renewable energy and raising the standards of energy use in the different sectors⁸. Partners of the project includes the International Union for Conservation of Nature\ Regional Office of West Asia⁹ (IUCN\ ROWA) and Future Pioneers for Empowering Communities (FPEC)¹⁰.

1.2.5 Project Intervention Areas

This project was implemented in three municipalities located within three countries in the MENA region which is comprised of the Karak Municipality in Jordan, Jdeidet El Chouf municipality in Lebanon and Monastir municipality in Tunisia (Figure 3). The following describes each country from a socio-economic perspectives.

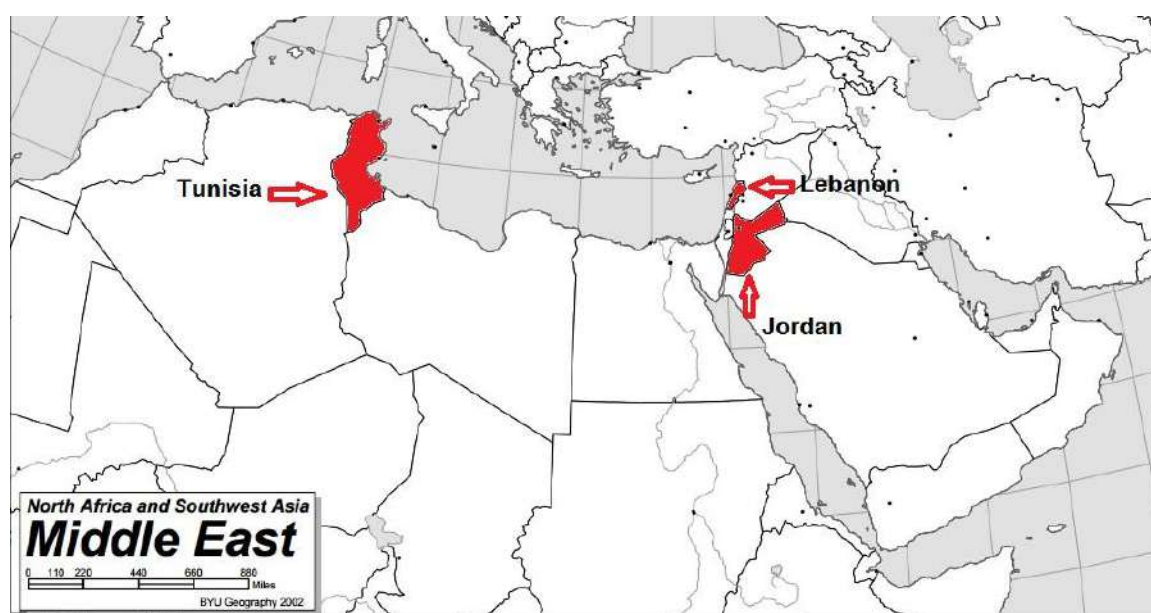


Figure 3: Targeted countries by the MINARET project

⁸ <http://www.nerc.gov.jo/Pages/viewpage.aspx?pageID=156>

⁹ <https://www.iucn.org/regions/west-asia/about-rowa>

¹⁰ <http://future-pioneers.org/>

1.2.5.1 Jordan

1.2.5.1.1 Overview: Energy and Water Challenges

Jordan, officially known as the “Hashemite Kingdom of Jordan” is a relatively-small, semi-arid country, with a population of 9.5 million inhabitants (Department of Statistics, 2015). Jordan is classified as a country of "high human development" with a "lower middle income" economy according to the World Bank¹¹. The country is a major tourist destination and also attracts medical tourism due to its well-developed health sector. Nonetheless, as with many other countries, Jordan faces substantial challenges, which are aggravated by the limited water resources, increasing population and the large influx of refugees, which have hampered economic growth and affected the dynamics and affluence of the local communities. It is well-known that Jordan is among the countries with high dependency on imported energy sources, whereby 96% of the country's energy needs come from the neighbouring Middle Eastern countries. Moreover, multiple attacks on the Arab Gas Pipeline which supplies 88% of the country's electricity generation needs forced Jordan's power plants into alternating to diesel and heavy fuel oil use. These factors and others have significantly affected Jordan's GDP and cost the treasury millions of dinars annually. Despite the ambitious targets set in the National Energy Strategy (2007-2020), to increase the contribution of renewable energy sources to the national energy supply, relatively little renewable power capacity has been deployed in Jordan, despite the growing interest in Concentrated Solar Power (CSP) and Solar Photovoltaic (PV).

Furthermore, Jordan is considered one of the poorest countries worldwide in terms of the availability of water resources. However, more than 97% of Jordanians have access to an improved water source and 93% have access to improved sanitation. This is one of the highest rates in the Middle East and North Africa. However, water supply is intermittent and it is common to store water in rooftop tanks. The level of water lost through leakage, under registration and theft in municipal water supply (non-revenue water) is estimated at about 44%. Water tariffs are subsidized. A National Water Strategy, adopted in 2009, emphasized on the need for desalination and wastewater reuse. The country receives substantial foreign aid for investments in the water sector, accounting for about 30% of water investment financing.

1.2.5.2 Karak Municipality

Jordan is divided into 12 provinces named governorates, which are sub-divided into 54 departments or districts. The governorates include Irbid, Ajloun, Jerash, Mafrq, Balqa, Amman, Zarqa, Madaba, Karak, Tafilah, Ma'an and Aqaba. The MINARET project targeted Karak governorate, which lies 140 kilometres to the south of Amman city, on the ancient King's Highway. It is situated on a hilltop about 1,000 meters above sea level and is surrounded on three sides by a valley. The MINARET project was designed to be implemented at the municipality of Karak, which is located within the Governorate of Karak.

¹¹ <http://data.worldbank.org/country/jordan>

The municipality was established in 1893 under Ottoman law and extends over an area of 425.8 km². In 1994, a group of village councils was merged into the Great Karak Municipality. In 2001, eleven municipalities were merged into the Greater Karak Municipality (Figure 4) to include the municipalities of Al-Thanieh, Ghuwair, Zahoum, Manshiyet Abu Hammour, Adar, Jadida, Rakin, Bateer, Zaid Ibn Haritha, Shehabiya, Adnaniyah, Wadi Karak, Al-Karak and Al-Marg areas¹².

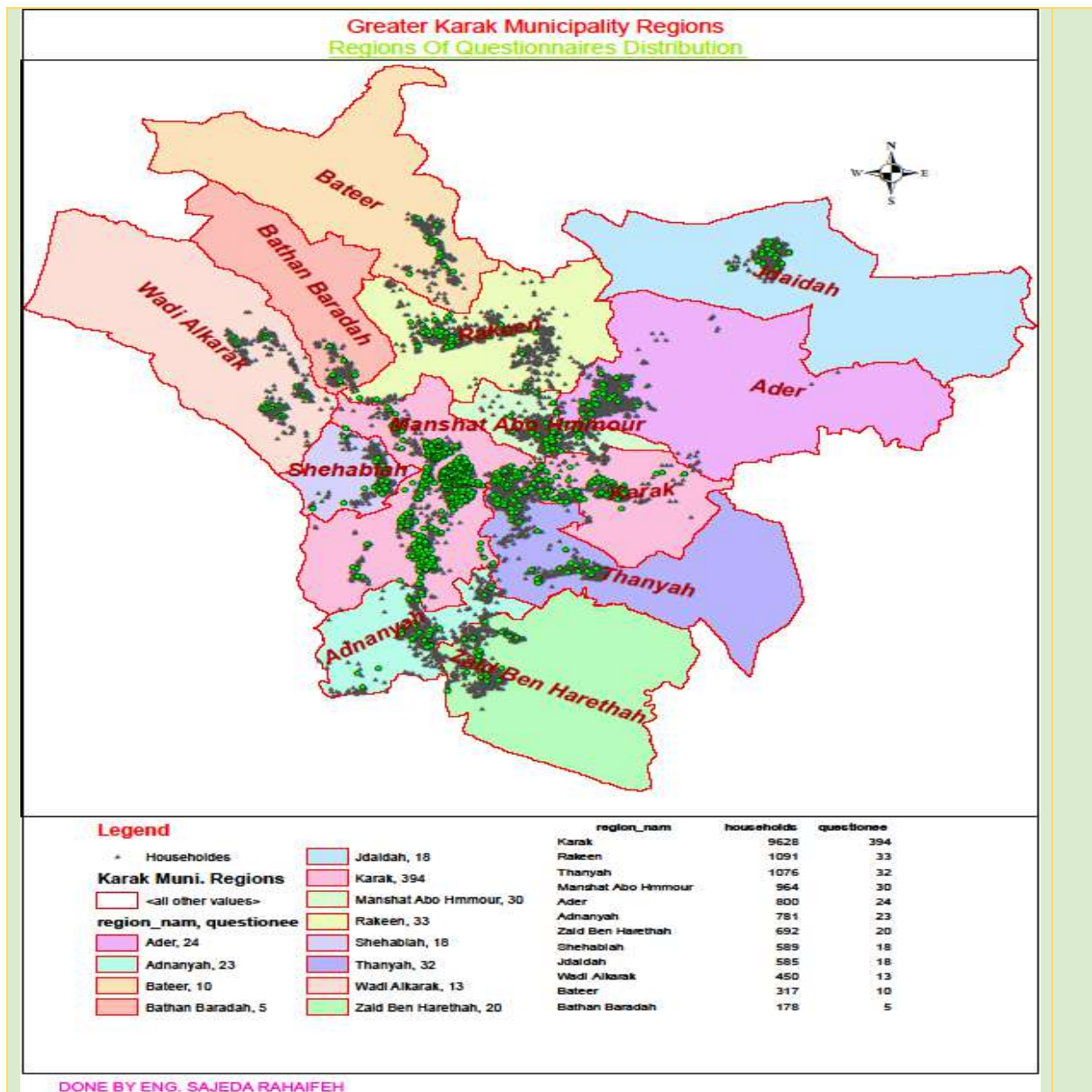


Figure 4: Karak Municipality boundaries and districts components

1.2.5.2 Lebanon

1.2.5.2.1 Overview: Energy and Water Challenges

¹² <http://www.karak.gov.jo/>

Lebanon, officially known as the “Lebanese Republic” is the smallest country in the mainland Asian continent, with a total area of 10,452 km². It has a population of 6,044 million people¹³. The Government of Lebanon estimated that the country hosts 1.5 million Syrian refugees, including 1.05 million registered with United Nations High Commissioner for Refugees (UNHCR). The Syrian refugees, along with 42,000 Palestine Refugees from Syria, have joined a pre-existing population of more than 270,000 Palestine refugees in Lebanon. The country is classified as a country of "high human development" with an "upper middle income" economy based on the World Bank ranking¹⁴. Lebanon relies essentially on oil imports as its main resource for energy production. The main energy sources imported include liquid gas, gasoline, gas oil, fuel oil, kerosene and asphalt. However, the country has embarked on the sustainable energy bandwagon since the commitment launched in Copenhagen in 2009 by the Lebanese Government to develop renewable energy (RE) technology. Therefore, Lebanon has developed the National Renewable Energy Action Plan (NREAP 2016-2020), aimed to reach 12% target of renewable energy use by 2020.

Unfortunately, while significant investments are made to tap water resources in Lebanon, very little is done to preserve it. Human activities exert strong pressures on both the quantity (water abstraction) and quality (water pollution) of water resources. Furthermore, many activities affect the water cycle (deforestation, dams, irrigation, drainage canals) thereby altering the conditions for water replenishment. Continued soil erosion and loss of plant cover (including forests), are seriously affecting water resources and poorer water quality. Lebanon is poised to experience a water deficit within 10-15 years, unless sound and radical water management policies are developed and implemented. Conflicts in the Middle East and the continuous influx of refugees are harsh reminder that re-thinking and prompt sustainable actions are needed to better enhance the Lebanese water strategy in the shortest timeframe possible, in order to protect water resources and use them more judiciously.

1.2.5.2.2 Jdeidet El Chouf Municipality

Lebanon is divided into six governorates, which are further subdivided into twenty-five districts. The districts themselves are also divided into several municipalities, each enclosing a group of cities or villages. The governorates are Beirut, Beqaa, North, Mount Lebanon and South Governorates. The MINARET project was implemented in Jdeidet El Chouf municipality. It is located in Chouf District at Mount Lebanon Governorate and it is well-known for its traditional architecture and crucial role in regional trade. The municipality forms part of the Federation of Chouf Es Souayjani Municipalities and its inhabitants are predominantly Druze.

1.2.5.3 Tunisia

1.2.5.3.1 Overview: Energy and Water Challenges

Tunisia, officially known as “Republic of Tunisia” is located in North Africa, with a spatial coverage of 165,000km². The population exceeds 11 million people¹⁵. The Tunisian’s energy situation has drastically changed in the last two decades. As a consequence of the economic

¹³ <http://www.worldometers.info/world-population/lebanon-population/>

¹⁴ <http://data.worldbank.org/country/lebanon>

¹⁵ <https://en.wikipedia.org/wiki/Tunisia>

development, primary energy demand has risen significantly more than energy production. Since 1990, the Tunisian primary energy consumption has increased in a roughly linear pattern, where the sharpest increase was recorded within the gas sector, which represented 55 % of the total primary energy supply. As a result, the share of oil, including crude oil and petroleum products, has slightly decreased. The share of coal and peat have always been minimal and recently reached zero. The amount of biofuel and waste have slightly increased and currently represents 15 % of the total primary energy supply. These factors and others such as the rate of energy subsidies by the government have led to a serious threat on the country's GDP. The World Bank categorises r Tunisia as a lower middle-income country¹⁶.

The water sector in Tunisia is faced with deteriorating infrastructure and declining service quality, as well as increasingly severe financial difficulties. These problems are exacerbated by the increasing scarcity of water resources and the fact that they are already heavily exploited, which makes further investment costlier. Transferring water from the north to the south has proven to be limited. The technological solutions to which the country might turn, such as exploiting non-conventional sources, are expensive. Operators are showing signs of exhaustion and are facing significant financial challenges because of rising costs, low tariff levels and the insistent demands for high-quality service. Governance of the sector, which is based on highly centralized responsibilities and decision-making powers, also has its limitations.

1.2.5.3.2 Monastir Municipality

Tunisia holds 24 governorates, which comprises of Ariana, Béja, Ben Arous, Bizerte, Gabès, Gafsa, Jendouba, Kairouan, Kasserine, Kebili, Kef, Mahdia, Manouba, Medenine, Nabeul, Sfax, Sidi Bouzid, Siliana, Sousse, Tataouine, Tozeur, Tunis, Zaghouan and Monastir Governorates. The MINARET project was implemented in the Monastir municipality (Figure 5), which is located within the Monastir governorate. The Municipality has a population of 93,306 individuals¹⁷ and covers an area of 1,019 km². Unemployment rate was estimated at 9.7 % of which 12.79 % are graduates (INS, National Institute of Statistics, 2017). Agricultural activities are considered to be the biggest threat to water resources, while industry is the sector with the highest energy consumption.

¹⁶ <http://data.worldbank.org/country/tunisia>

¹⁷ https://en.wikipedia.org/wiki/Monastir_Governorate



Figure 5: The Monastir municipality boundaries

1.3 Study Objectives

To attain the aim of the study, the following objectives were set:

1. Map out the demographic and socio-economic aspects of the project sites.
2. Assess the use and dependency of the communities on energy technology and efficiency, water use and management and how they correlate resource use to food security.
3. Evaluate the local knowledge, attitude and perceptions with regards to energy technology, alternative energy options, water use and management and food production and security.

Chapter Two: Methodology

The methodology and all data collection tools for this assessment were designed in accordance to the MINARET project needs for the project “The MENA Region Initiative as a model of NEXUS Approach and Renewable Energy Technologies” and in accordance to the objectives set in the proposal documents. Several research methodologies were designed to be used in a framework that effectively responded to the purpose of the project.

Inclusive in the development goals of the survey was the equal efforts and enthusiasm were injected in all three surveyed municipalities, to ensure consistency, data precision and comparative analyses. Data collection focused on households, where a household is considered a unit and an individual contributes socially and economically to that unit. Institutions, which included governmental and non-governmental (NGOs) entities located within the municipality boundaries were also targeted (Figure 9).

Three main methods used for this study included a detailed desktop review for the existing information. Furthermore, a structured questionnaire targeting household and institutions as well as focus groups were implemented equally within each municipality. The following sections provide a detailed overview on the approach and methodologies used during the surveys.

2.1 Desktop Review

A desktop review was carried out to enhance the current understanding on the studied municipalities. A review of existing grey and published literatures, and other relevant articles were conducted. Additional sources of information including scientific or non-scientific reports and online resources were also reviewed.

2.2 Structured Questionnaires

Due to the absence of data on the socio-economic status of the study sites, the survey assessment was formulated based on a number of variables, namely:

- Community members’ perceptions on the use of energy, water and their implications and impacts on food production, using the “NEXUS” approach.
- Impacts, both positive and negative, of using energy and water sources in business activities especially on agricultural fields.
- Households’ utilization and investment in long -term, sustainable and environmentally- friendly resources that will better enhance their socio-economic situation.
- Household and community perceptions on their social statutes and the public services available to improve livelihoods.

A total of two structured questionnaires were designed and used to gather the required information at household and institutional levels, where the latter included two questionnaires developed for data collection in governmental and non-governmental institutions. The following illustrated the methodologies applied at household and institutional levels.

2.2.1 Household Level Survey

The research questions included in the household questionnaire was divided into three main sections. The first section explored the general information such as demographics on the household level, whereas the second investigated the use of energy, water in agriculture and food production. The third section aimed at gathering general information regarding the available services at municipality level (Annex IV).

A Senior Supervisor was appointed to lead r all the day-to-day management of data collection, sourcing appropriate surveyors, computing and delivering final data to the consultant. Th Senior Supervisor underwent training prior to the surveys to ensure that:

Full understanding of the project aims and objectives as well as the survey expected outputs was attained.

- Mock data collection, completing the questionnaires as well as conducting focus groups sessions were completed and can be replicated throughout the surveys.
- Gender related considerations was adhered during the data collection process.
- Reliability for all survey related communications was well understood and accounted for.
- Confidentiality was maintained during survey and data collation.

Ten surveyors from the local communities were sought to assist with data collection in each project site (Table 1). Training of the trainer approach whereby the Senior Supervisor provided training to the surveyors were conducted prior to survey commencement. Full project surveys were conducted under the supervision of the Supervisor, with clear directives and guidance from the Project Consultant.

Table 1: Number of Data Collectors Assigned for the Study Purposes

| Locality | Number of Males | Number of Females |
|----------|-----------------|-------------------|
| Jordan | 3 | 7 |
| Lebanon | 3 | 7 |
| Tunisia | 6 | 4 |

The survey was initiated in June 2017, in the three municipalities and over two weeks period. The average length of each survey was approximately 35-45 minutes per household. Respondents interviewed in this study included the head of household/ male and the housewife/ female of family member who fully understood their household situation. However, for information pertaining to the property status, education, income, time allocation, division of labour and decision-making processes within each household, both men and women within the randomly selected household were interviewed but individually to ensure there was no bias. A total of 300 household respondents were interviewed, inclusive of the 95% confidence limit for ease of statistical analyses during data interpretation.

Respondents were chosen randomly from the existing population within the municipality boundaries (Figure 6).



Figure 6: Data collections on the household level

2.2.2 Governmental and Non-Governmental Institutions Questionnaire:

Institutions within each municipality were divided into two main categories, namely the governmental and non-governmental institutions. A detailed questionnaire was developed which included two main sections to investigate the number of beneficiaries from the services provided by the municipality and how to deal the range of services were distributed and catered for y each municipality. Semi-structured interviews with representatives from each institution were conducted to gather further data and additional information that encompassed broader spatial and temporal coverage within each municipality, compared to household level data.

2.3 Focus Groups

A total of three focus groups discussions were held within each municipality which targeted specific demographic

Each focus group focused on key aspects which were clearly defined and structured before conducting discussions. Other issues of interests were considered as they arose in the discussions. The key aspects comprised of:

- General knowledge on the types and sources of energy and water sources available, including their views on the advantages and disadvantages of using and heavily relying on these resources. Their perceptions on how the community as a whole can overcome the challenges related to energy, water and their uses in agriculture and households.
- Using gender as a determining factor to assess knowledge and perceptions, discuss the various ways women's involvements in the household can impact how water and energy sources can be used efficiently.
- Carry out SWOT analysis (strengths, weaknesses, opportunities and threats) for the use of energy and water and their implications in the agricultural sector.
- Identify potential projects which are applicable to their municipality, household and individual levels and how they are related to the study objectives.

The targeted stakeholders included, but were not limited to the following:

- Municipality leaders from both gender.
- Community-based organizations (CBOs).
- Private sector working in the energy and water sectors, governmental representatives especially departments related to water, energy and nutrition.
- General public and local communities.
- Media channels active within each municipality.

2.4 Observations and Photographic Records

Observation of any development situation, any tangible outcomes and livelihood activities was collected by observing and recording behaviour, events, or noting physical characteristics in their natural settings. For ethical purposes, overt observations were used, where all observations made were acknowledged by the interviewers. A set of photos were collected after the approval of the interviewees. No photos will be used in other purposes except this report and all photos will be stored on an encrypted drive at the MINARET project management unit for confidentiality and intellectual property purposes

2.5 Data Processing and Entry

All questionnaires were reviewed carefully, edited to ensure consistency with project objectives and approved by the project consultant and the project management unit prior to the commencement of any fieldwork. Digital data entry forms using Microsoft Excel were designed for quality control, ease of data quality and computation following the surveys.

Data entry was carried out by surveyors as soon as the surveys were completed to ensure complete data set and allowed for prompt processing.

2.6 Data Analysis Tools

Data analysis was conducted using SPSS (Statistical Package for the Social Sciences) software and Microsoft Excel for graphical representations.

2.7 Gender Mainstreaming and Diversity

The project was designed in such a way that allowed for mainstreaming gender and diversity in the planning, design and implementation phases. Gender aspect was found critical as various groups within households and communities used and perceived water and energy resources and their implication in food production differently and their knowledge, experiences and perspectives differed considerably.

The following measures were applied by the project consultant to ensure gender mainstreaming:

- Review of all developed materials from the project gender specialist.
- Gender was considered when hiring the senior advisors and surveyors.
- Surveyors included both gender and were locals from the targeted project sites.
- Survey materials were translated into Arabic and distributed in all three project sites to ensure consistency and accuracy across the board.
- Focus groups discussions were organised to factor in gender and demographic groups in each municipality.
- Household interviews were conducted randomly and included both gender.
- Ensure household questionnaires were designed to cater for diversity, gender and age- specific groups.

It should be noted that despite all aspects of gender considerations, equal numbers of interviewees from both gender were not obtained on the household level.

2.8 Ethical Clearness and Confidentiality Consideration

Ethics approvals was obtained from the Royal Scientific Authority (RSS) for the surveys and all issues included in the questionnaires received the approval from the project management unit. Participation of a selected respondent was voluntary and each household interviewed was notified of the survey by showing the official letter provided by the RSS, detailing the purpose and objectives of the survey. Furthermore, each interviewer showed proof of photographic identification and highlighted his/her stance with regards to role and objectives in participating in the survey.

Information disclosed during the interview were kept strictly confidential and used only for the purpose of the survey. Interviewees were kept anonymous and final data sets were safely stored by the project management unit.

Chapter Three: Household Demographic and Socio-economic Profiles

3.1 Demographic Profiles

Studying and understanding demography is important as it contributes to serve the MINARET project management unit with key information and ways on how to adapt and tackle anticipated initiatives brought about by population growth at municipality level. The results obtained following data analyses could support the selected energy and water efficiency tools or provide a good estimate on the required level of funding for each municipality to duly address sustainable energy and water uses and management.

The demographic data obtained from the surveyed countries showed a tremendous population growth, as a result of to the political climate and immigrations. In 2016, the population of Jordan was estimated at 8,185,384 people, with a population growth of 0.83%. i the birth rate was recorded at 25.5 births/1,000 population whereas the death rate was 3.8 deaths/1,000 population. Generally, there was an improvement in drinking water sources in both the urban areas (97.8% of the population) and the rural areas (92.3% of the population). Sanitation facility access had also improved as well in both urban areas (98.6%) and rural areas¹⁸(98.9%).

In Lebanon, the population was estimated at 6,237,738 people in 2016, with a population growth of 0.85%. The birth rate was recorded at 14.4 births/1,000 population where the death rate was 4.9 deaths/1,000 population. Generally, there was marked improvement in the drinking water sources in both the urban areas and rural areas (both had 99% of the population). Sanitation facility access had also improved all in both urban and rural areas (both had 80.7%¹⁹of the population).

In 2016, the population in Tunisia was estimated at 11,134,588 people, with a population growth of 0.86%. The birth rate was recorded at 16.4 births/1,000 population whereas the death rate was 6 deaths/1,000 population. Generally, there was an improvement in the drinking water sources in both the urban areas (100% of the population) and rural areas (93.2% of the population). Sanitation facility access had also improved, with a marked increase in the urban areas (97.4% of the total population) as opposed to the rural areas (79.8%).

3.1.1 Families Size

It is well- known that the size of the family is an extremely important topic for human welfare and it has significances on families, communities and the countries in general. Blaney (1980) stated that high fertility rates have historically been strongly correlated with poverty, high childhood mortality rates, low status and educational levels of women, deficiencies in reproductive health services and inadequate availability and acceptance of contraceptives.

¹⁸ http://www.indexmundi.com/jordan/demographics_profile.html

¹⁹ https://www.indexmundi.com/lebanon/demographics_profile.html

Based on the Organization for Economic Co-operation and Development (OECD)²⁰ of the World Bank, the mean personal ideal number of children for men is just under 2.2 and for women around 2.3, slightly above the population replacement rate level of 2.1 children per woman.

Based on the survey results, there were slight substantial differences across the three surveyed municipalities with regards to the average size of households interviewed. The average for 'all households' ranged from 1.0 person per household and 9.0 people per household. These results were basically due to the social context in the Arabian region, where the proportion of multiple- occupancy households were affected by both the tendency of young adults to live in their parental home and the tendency of elderly people to live with their children. Moreover, fertility rate is generally considered high in the Middle East and North Africa "MENA" region compared to other regions worldwide.

Furthermore, closer values were noticed from the obtained family size data in all municipalities when compared to the national statistics. However, all values exceeded the ideal number expressed by the Organization for Economic Co-operation and Development (OECD). The family size in the Karak Municipality was found to be 5.09 individuals, which was slightly higher than the national average family size in Jordan which was 4.8 individuals²¹. The family size in Jdeidet Al-Chouf was found to be 3.92 individuals, which was lower than the national level which was 4.3 individuals²²²³. In Tunisia, it was found that the family size was 3.84 individuals, which was very close to the national statistics which recorded at 4.1 individuals per family ²⁴ (Figure 7).

²⁰ https://www.oecd.org/els/family/SF_2_2-Ideal-actual-number-children.pdf

²¹ Department of Statistics, Population and Housing Census 2015

²² <https://www.arcgis.com/home/item.html?id=059d1b4855054eae8c9948a9603f6299>

²³ Demographic 2007- ar lebanon

²⁴ <http://www.arcgis.com/home/item.html?id=35435ebe8ab2477aa66d8077fdf88616>

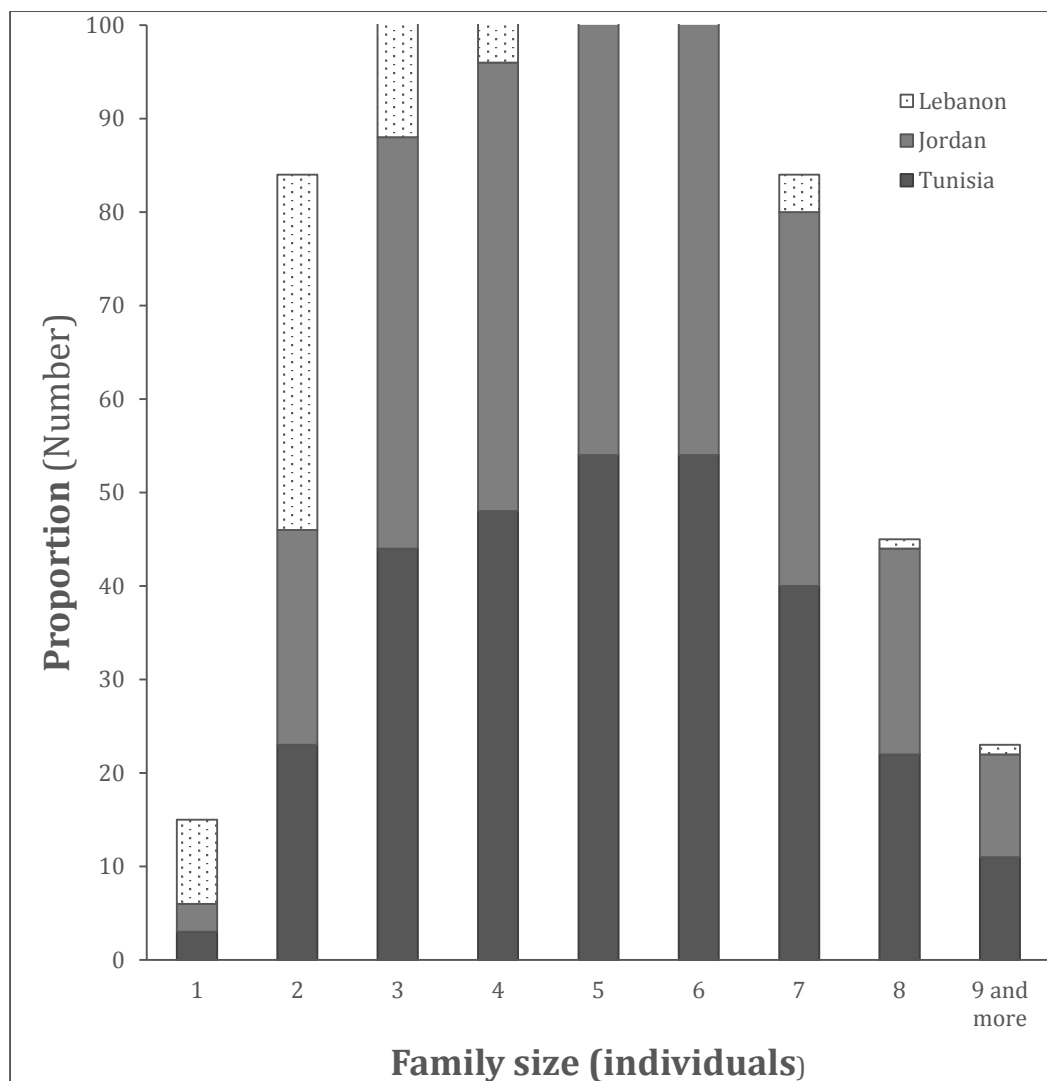


Figure 7: A comparison between family size in Jordan, Lebanon and Tunisia

It was evident that large family size impacted on water and energy use in terms of volumes used at both household and community levels. Comparing the three countries, both Jordan and Tunisia had the highest proportion of large families, compared to Lebanon. The highest proportion (97 in total) in terms of family size in Lebanon had 4 individuals living in a household, and for Jordan and Tunisia (54 each in total) had either 5 or 6 individuals in a household.

3.1.2 Families Structure

The traditional family structure in the Arabian region is unique and builds on a family support system, where parents are providing care and stability for their children and vice versa in what is also known as the “Nuclear Family”. The young age composition in any family contributes to the country’s high dependency ratio and is an indication of high fertility level, which can be a burden on the country’s economy.

The results from the survey showed a young age composition structure in all surveyed countries, where the majority of the population in the Karak Municipality had a young age

structure ranging between 11-30 years old (51.3%). About 26.8% of the young individuals were under 10 years of age, whereas the elderly of 60 and over represented only 2.2% of the total population. Although, the percentage of young age structure from 11-30 was lower in Lebanon and constituted of 35.9% of the total population, it was still considered the highest, as compared to the elderly of 60 and above (7.8%) or those aged below 10 years (13.6%). Tunisia had the largest proportion of the young age group (11-30 years), with 45.8% of the total population, 17.3% were found to be below the age of 10 and 5.1% were the elderly of 60 and above (Figure 8). Results obtained were equally distributed between males and females. The proportions of males and females were evenly distributed across the age groups.

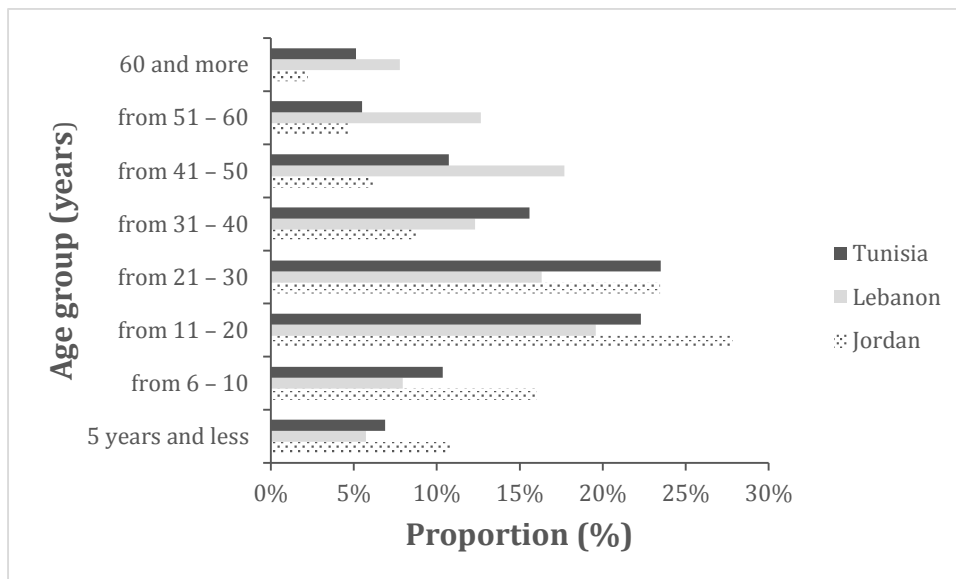


Figure 8: A comparison between family structure in terms of age groups in Jordan, Lebanon and Tunisia

Table 2 below illustrates the age structure of families with regards to gender. The young age composition accounted for a very high dependency ratio in terms of income and subsistence. However, the surveyed municipalities face several challenges in terms of unemployment, poverty rate and the availability of resources. Such challenges pose a significant burden on the municipality and government in terms of securing and ensuring access to basic needs. The majority of interviewees were from the 11-30 years age group in all three project sites, with most females recorded in Jordan, followed by Tunisia. Higher proportions of males were recorded in the Tunisia in the 11-30 years age group, followed by Jordan. The lowest proportion of elderly aged 60 or over was recorded in Jordan, while the highest was recorded in Lebanon.

Table 2: Age structure of the families interviewed

| Age structure | Jordan | | Lebanon | | Tunisia | |
|------------------|--------|--------|---------|--------|---------|--------|
| | M | F | M | F | M | F |
| 5 years and less | 13.80% | 7.50% | 6.30% | 5.10% | 8.60% | 5.40% |
| from 6 – 10 | 15.30% | 16.80% | 7.70% | 8.20% | 12.60% | 8.50% |
| from 11 – 20 | 25.80% | 30% | 21.20% | 17.90% | 26% | 19.20% |
| from 21 – 30 | 23.40% | 23.50% | 16% | 16.60% | 27% | 20.50% |
| from 31 – 40 | 8.50% | 9.10% | 9% | 15.80% | 14.60% | 16.40% |
| from 41 – 50 | 5% | 7.50% | 16.50% | 18.90% | 4.40% | 16.10% |
| from 51 – 60 | 5.20% | 4.10% | 14.40% | 10.90% | 3% | 7.60% |
| 60 and more | 3% | 1.40% | 8.80% | 6.70% | 3.80% | 6.30% |

3.1.3 Literacy Level of Household Head

The literacy level in most Middle Eastern and North African countries (MENA region) was rather low, especially in the rural areas. Based on several previous studies²⁵; higher level of education for the population of a country will certainly lead to more economic growth, less poverty and inequality and is fundamental for the construction of democratic societies and dynamic, competitive economies.

This survey measured the literacy level of the household head, since it is anticipated to implement small initiatives on the household level, where the head involvement and approval will be necessary. It was found that educational level of the household head in the Karak Municipality was high; 33.1% of total respondents were high school certificate holders, followed by 26.8% whom hold university degrees(bachelor). Meanwhile, vocational trained household head were the least represented in Karak with 3% of the total respondents. However, the number of household heads who were either illiterate or had higher education level was similar (5%) (Figure 9). The illiteracy rate obtained in the Karak Municipality was in accordance to the national illiteracy rate of Jordan²⁶.

Lebanon on the other hand had the highest level of university degree holders (bachelor) by household heads (27.6% of total respondents). 23.3% of respondents were at the preparatory stage. There were very few numbers of respondents possessing higher education qualifications (1.3%) and illiteracy level was measured at 3% of total number of respondents (Figure 9).

It was observed that the illiteracy rate in Jdeidet Al-Chouf Municipality was significantly lower than the national illiteracy rate recorded at 9.3%²⁷. In Tunisia, the highest number of household head responders (33.1% of total number of respondents) attained only high school education level, compared to 26.8% of total respondents who are university degree holders. Very few household heads attained elementary training level (4%) and vocational training qualifications level was ranked lowest (only 3% of the total number of respondents) (Figure 9). The illiteracy rate for the Monastir Municipality was the same as the national illiteracy rate.

²⁵ World Bank, 2002a; Barro, 1999; Sen 1999: Case 2001

²⁶ Department of Statistics, Population and Housing Census 2015

²⁷ Living conditions survey 2007

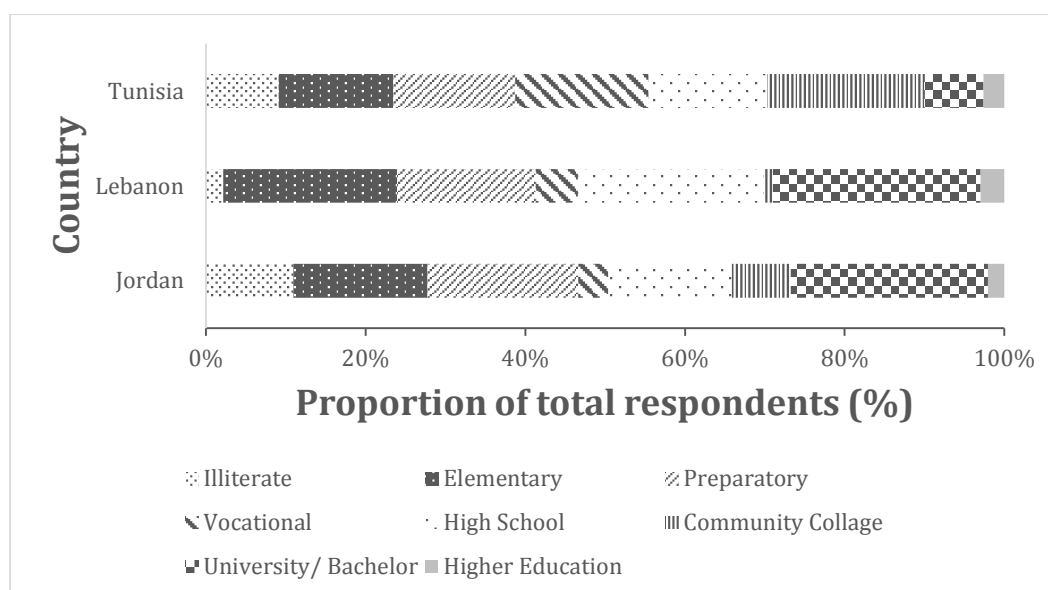


Figure 9: Literacy level of the household heads in each project site.

According to these results, good investments can be made in each municipality if the use of those educated household heads were incorporated in the national plans to generate income and advance social statutes. This will in turn increase the opportunities of communicating the benefits of applying water and energy conservation tools into the food production sector. Furthermore, the opportunities in future investment in human capital on the household level can be vast and possible i as the expected rate of returns later in life will outweigh current dependence, thereby influencing how parents perceive the anticipated interventions made available through the MINARET project.

It was noticed that equal gender opportunities in higher education (i.e. university and postgraduate levels) existed in both Jordan and Lebanon. This was not the case in Tunisia where the study showed that university education had a low percentage in terms of number of degree holders compared to large numbers of household heads attending high school and community colleges In general, there was consistency in literacy level between males and females at the different educational levels (Table 3).

Table 3: Education and gender perspectives

| Age structure | Jordan | | Lebanon | | Tunisia | |
|----------------------|--------|--------|---------|--------|---------|--------|
| | M | F | M | F | M | F |
| Illiterate | 13.10% | 8.60% | 2.40% | 2.10% | 7.10% | 10.70% |
| Elementary | 17.20% | 16.30% | 27.20% | 18.30% | 14.00% | 14.70% |
| Preparatory | 18.60% | 19% | 16.00% | 18.30% | 17% | 13.60% |
| Vocational | 4.40% | 3.10% | 3% | 6.80% | 17% | 16.70% |
| High School | 16.60% | 14.20% | 19% | 25.80% | 15.20% | 14.50% |
| Community Collage | 6% | 8.90% | 1.50% | 0.90% | 18.80% | 20.40% |
| University/ Bachelor | 21.90% | 27.80% | 26.30% | 25.80% | 8% | 7.00% |
| Higher Education | 2% | 1.90% | 4.40% | 2.10% | 2.90% | 2.40% |

3.2 Socioeconomic Conditions

This section illustrates three major parts which contribute to our understanding of the economic situation of the surveyed households during the study period. The topics will include details on the residence area characteristics, income level and the economic activity status.

3.2.1 Residence Area Characteristics

This section was designed to understand the size of the residence area of each household surveyed and to understand the ownership status. The majority of housing sizes in Jordan and Lebanon were found to be within an area that ranged from 141 m² to 201m² (N=163), which is decent and provided basic needs for the surveyed families, irrespective of family size or age composition structure (Figure 10). In both Jordan and Lebanon, more than 341m² in size. Generally, housing sizes in Jordan ranged between 50-199m², whereas houses in Lebanon were found to be in the 80-130m² size category.

The situation in Tunisia is different since the majority of housing sizes were found to be less than 140m². Like Jordan and Lebanon, very few houses were found to exceed 341m² in size. Housing on the municipality level lies within the national context which ranged between 50-199m² ²⁸. The housing size is very important since it has direct correlation with the consumption rate of both water, energy resources as well as food production.

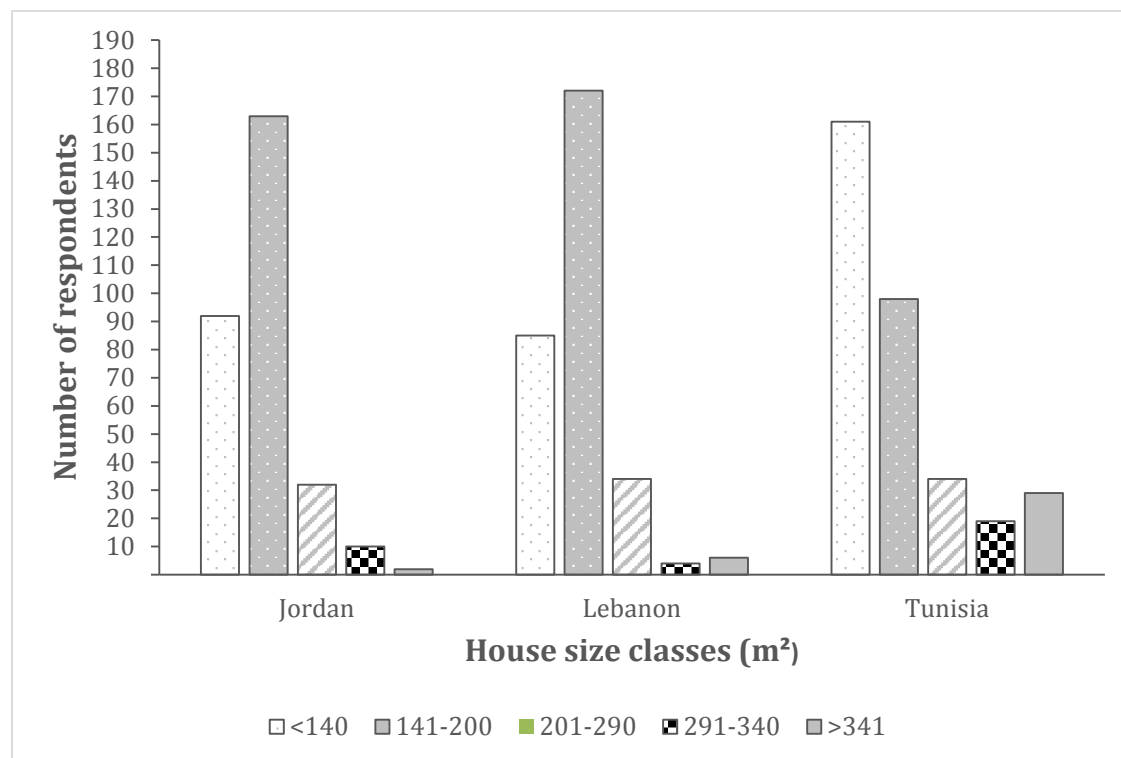


Figure 10: Distribution of house size classes in each project site.

²⁸ Department of Statistics, Population and Housing Census 2015

Housing ownership was extremely important since it can contribute to sustainable interventions on the household level, better management and clear monitoring scheme development. The survey showed that the majority of houses (>75%) in all surveyed municipalities were owned by the household heads.

3.2.2 Income level

Generally, income rate is a major contributor to human welfare and how households respond to income changes is of critical importance to household heads. Income could be generated either through conditional means such as a continuous income stream from the jobs, consultation or private businesses, or unconditional cash, which could be generated from minimizing the consumption rate through the adoption of new technologies as means of promoting water and energy conservation. The current study took into consideration the income level of each household surveyed in order to understand the impact of the project intervention.

The majority of households surveyed in the Karak Municipality in Jordan depended on the public sector, working in the army and as public security officers for their main income source. The average monthly income amounted to 847.93US\$, which was lower than the national average income rate of 1,038.5 US\$²⁹. Households surveyed in the Jdeidet Al-Chouf municipality at Lebanon, showed that the majority of respondents were strongly reliant on employment in the private sector or as business owners, with an average monthly income reaching 1,302.63 US\$, which was found to be higher than the national average income, which stood at 509.2 US\$³⁰. In Tunisia, the income level in the Monastir municipality was similar to the Lebanese main economic activities, where communities depended on the private sector and private business owners, with an average monthly income of 1,331.805 US\$. This rate was higher than the national average which was estimated to be 1,038.5 US\$³¹.

The consultant assessed the monthly income on the household level to investigate whether the total earnings were sufficient to support the family for a whole month. Results from the Karak Municipality in Jordan indicated that 35% of respondents stated that the income was insufficient and 49.2% of total respondents indicated that the income was sometimes sufficient, with 27.5% indicating that the income was always sufficient. The situation was different in the Jdeidet Al-Chouf municipality in Lebanon, where 9% of the total respondents stated that their income was always insufficient, compared to 47.8% admitting that their income was sometimes sufficient. Out of this, 43.2% of the total respondents admitted that their incomes were always sufficient. The results obtained from the Monastir municipality in Tunisia showed similar pattern obtained from Lebanon; 13.5% of total respondents stated that the income was always insufficient, 46.3% of total respondents stated that it was sometimes sufficient, while 40.2% of respondents stated their income was sufficient to support their families.

²⁹ Department of Statistics/ Household Expenditure & Income Survey 2010

³⁰ Living conditions survey 2007

³¹ Department of Statistics/ Household Expenditure & Income Survey 2010

3.2.3 Employment Status

Employment status was described as the job each household interviewee undertook to earn a living. This was an important measure as it provided clear understanding on the source of income per household, and also the links between people's affluence and perceptions on the introduction of new technologies. It was found that the employment rate in Karak was 29.8%, which was significantly lower than the national average employment rate reported at 50%.³² In the case Jdeidet Al-Chouf in Lebanon, the employment rate was higher than Karak, recorded at 35.9% which was even lower than the national employment average, which stood at 44%³³. The employment rate in Monastir was found to 37.2%, which was also lower than the national employment average of 84.8%³⁴. It was clearly seen that the lower employment rate recorded to all three project sites were significantly lower than the national context (Figure 11). Despite its negative effects at family and municipality levels, such employment rate provided a great opportunity for the MINARET project to introduce small initiatives within each municipality, thus contributed positively in enhancing the employment rate.

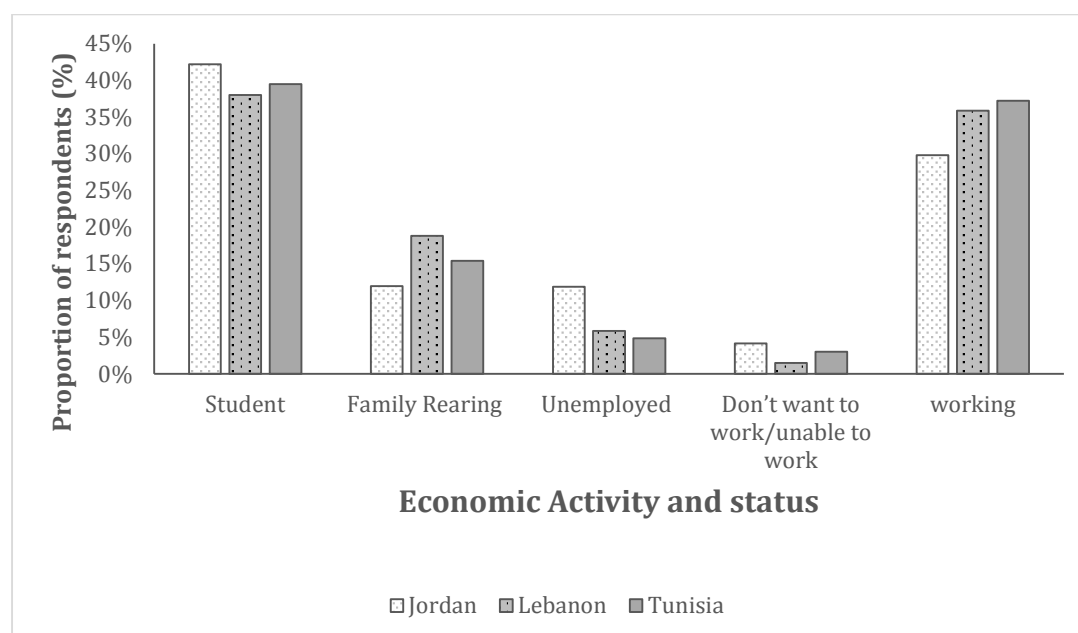


Figure 11: Employment rate and distribution of economic activities within the surveyed municipalities.

3.3 Energy, Water and Food Resources Available on the household level

This section introduces the part of the questioner, which measures people perceptions toward different aspects related to energy, water and food production. Sections shall introduce available resources used on the household level, knowledge about the renewable

³² Department of Statistics, Population and Housing Census 2015

³³ Living conditions survey 2007

³⁴ Statistiques Tunisie, Population and Housing Census 2014

energy resources and attitude toward applying these resources. Sections were ordered starting by energy, followed by water and food at the end.

3.3.1 Energy on the household level

3.3.1.1 Resources available at Households Level

Jordan is considered among one of countries worldwide with high dependency on imported energy sources; with 96% of the country's energy needs in the form of oil and natural gas are brought into the country from neighbouring Middle Eastern countries. Natural gas is increasingly being used to fulfil the country's domestic energy needs, especially with regard to generating electricity.

Results from the survey showed that 91.4% of households used electricity and gas as their major sources of energy in the Karak Municipality, costing them an average of 53.15 US\$ per month as utilities. Only 4.3% of households made use of solar energy as their main energy source. Electricity was mostly used for lighting and water heating and gas was mostly used for cooking and water heating (Figure 12).

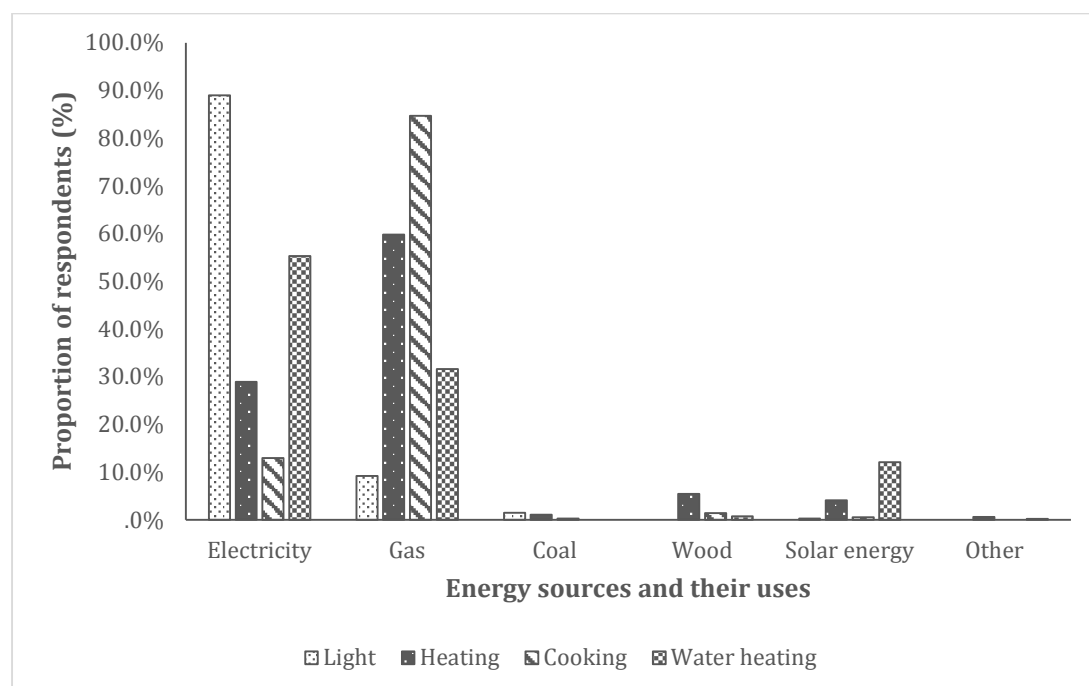


Figure 12: Energy sources and their uses in Karak Municipality

Households in the Jdeidet Al-Chouf municipality in Lebanon also made of electricity and gas as their main energy sources, with an average monthly bill amounting to 107.29US\$. Very few households (5%) made use of solar energy. Electricity was mostly used for lighting and for cooking, whereas gas was mostly used for cooking.

In terms of reliance, Households in Lebanon had higher reliance on electricity for cooking, compared to those in Jordan (Figure 13).

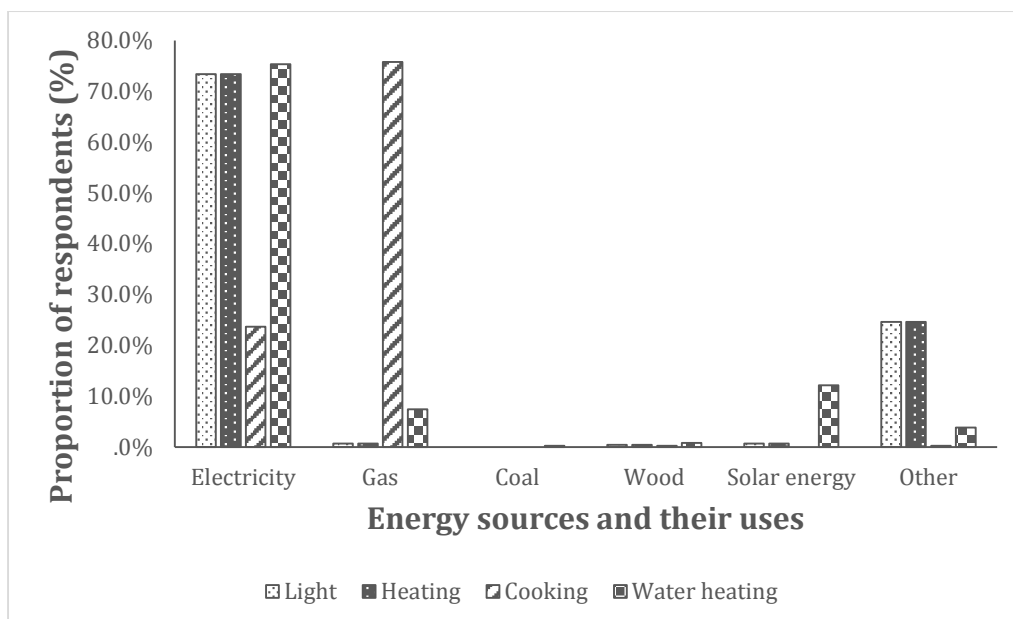


Figure 13: Energy sources and their uses in Jdeidet Al-Chouf municipality.

The average monthly costs of energy consumption on the household level at Monastir municipality is 30.57 US\$. It was also found that people are highly reliable on electricity and gas for most of their energy needs (90.4%), with a very low usage of solar energy which constitute only 3.1%. Electricity is used for lighting purposes, where 92.8% of the interviewed people stated that. The gas is basically used for heating purposes in winter season, while it is used for cooking and water heating (Figure 14).

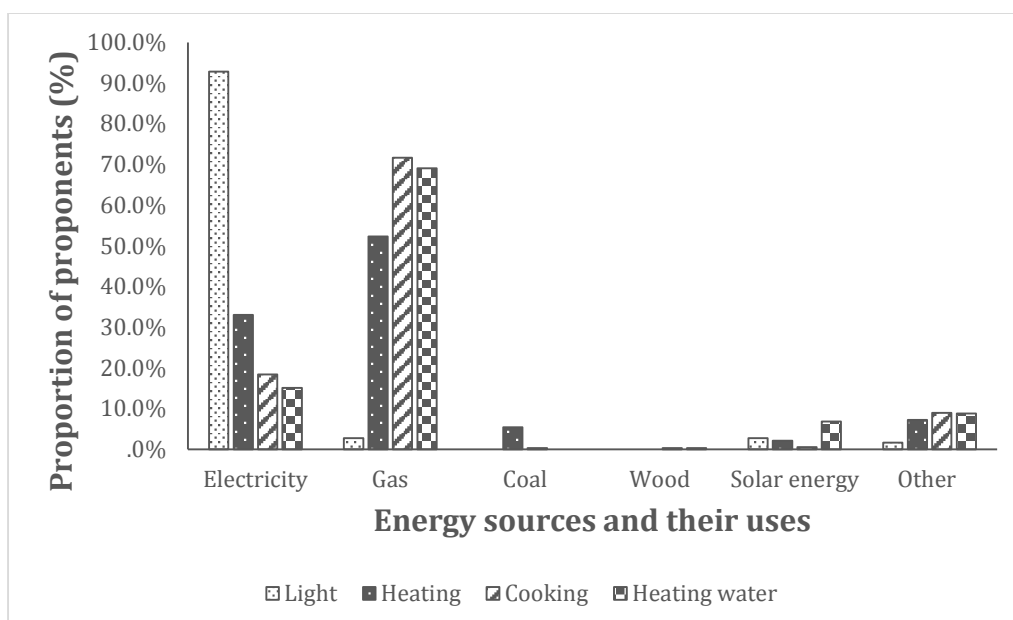


Figure 14: Energy sources and their uses in Monastir municipality

The limited use of solar energy was alarming in all surveyed countries and required more attention from the governments, municipalities and even the MINARET in terms of educating

people on the importance of this making use of cleaner, renewable energy source and how its use and implications can positively impact on their livelihoods and economic status.

3.3.1.2 Energy Resources Used for Agriculture Purposes

The survey investigated the use and types of energy sources for agricultural purposes. The results showed that the majority of households in Karak (84.3%), Jdeidet Al-Chouf (85.7%) and Monastir (84.3%) municipalities did not own or rent any agricultural land. or even rent one with 84.3%, 85.7% and 84.3% respectively.

However, the majority of landowners in the Karak municipality (55.6%) relied on solar energy as their main energy source for lighting and operating agricultural equipment. Landowners used mostly diesel (51%) and electricity (21%) for pumps used in irrigation for the land; very few respondents (11.8%) made use of solar energy for irrigation.

The MINARET project management unit therefore aimed to build on the existing knowledge and practices of using solar energy in agriculture, to introduce other clean technologies for irrigation purposes. This will in turn contribute positively to achieving the project objectives using the NEXUS approach, as well as support landowners through generating additional income in terms of lowering cost of expenditure incurred during operations and enhanced their and livelihoods.

The situation in Jdeidet Al-Chouf in Lebanon was different since no adoption of solar power was recorded in neither the agricultural activities nor for irrigation. The energy sources used were mostly gasoline, where 49% of households depended on its use, followed by diesel of which 19.6% of the respondents admitted to its use and electricity with 11.8% of the respondents making use of it for agricultural purposes. These energy sources were mostly used to operate farm machinery and for cooking purposes. Such high use and reliance of non-renewable energy sources were deemed alarming, urging for education and awareness campaigns on clean and renewable energy sources, as well as energy efficiency techniques to be introduced on the household level. The Tunisian experiences in the Monastir municipality was very similar to Jdeidet Al-Chouf in Lebanon; no solar energy was used for either agricultural practices or irrigation. Most households used electricity (59.1% of total respondents) to operate farm machinery and for lighting purposes. They also made use of diesel (13.6% of total respondents) and gasoline (22.7% of total respondents).

3.3.1.3 Water Resources Used at Households Level

The results indicated that a monthly cost of 29.45 US\$ was incurred by households to cover cost of water in the Karak Municipality. The population was heavily reliant on the public grid as the main water source, followed by filtered water (Figure 15). Very few respondents admitted to practice rainwater harvesting at home for their water source within their households. In the case of Jdeidet Al-Chouf, very few households made use of rainwater harvesting; most households made use of the public grid for their water requirements, followed by filtered water, spring as well as tanks (Figure 15).

Rainwater harvesting was found to operate better in the Monastir municipality, compared to both Karak and Jdeidet Al-Chouf; however, the vast majority of households were more reliant on the public grid and filtered water to meet their water needs (Figure 15). Water served many purposes and was not limited to only laundry, home gardening or cooking. However,

the results of the study concluded that there should be additional investment to support rain water harvesting technologies as well as increase awareness and capacity building programs.

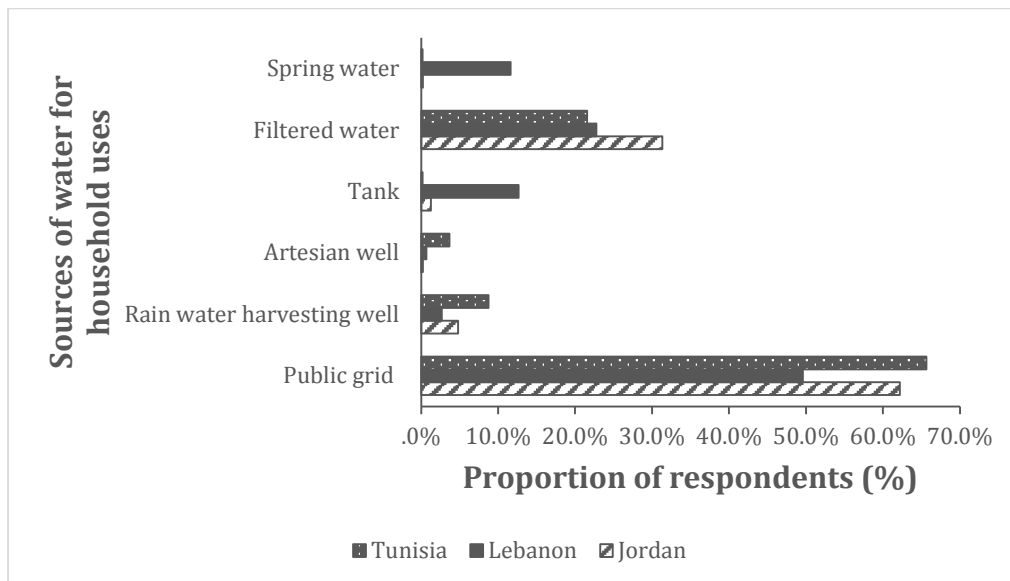


Figure 15: Water sources used on the household level in all three project sites

3.3.1.4 Water Resources used for Agriculture Purposes

It was found that Karak and Jdeidet Al-Chouf municipalities both made use of public grid for their water supply, to be used in irrigation. Spring was also used as a source to supply water in Lebanon. Rainwater harvesting techniques were put to better use when gathering water for irrigations than for household use; however, its technology can be further improved and supported in the Jdeidet Al-Chouf municipality to make better use of the annual precipitation level, which was higher than that recorded in both Jordan and Tunisia (Figure 16).

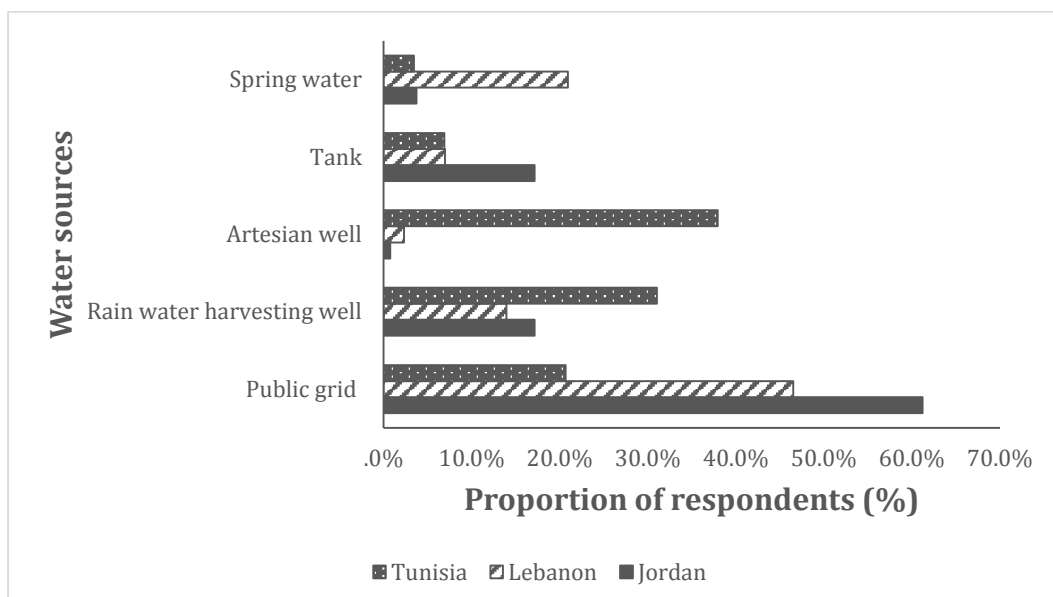


Figure 16: Water sources used for irrigation in agricultural areas of the three project sites

Irrigation is required for agricultural crops growth and survival, maintain landscapes and helps revegetate disturbed soils in dry areas and during periods of inadequate rainfall. Several techniques were used for irrigation, where surface irrigation implies the water which moves across the surface of an agricultural lands, in order to provide moisture and infiltrate into the soil. The sprinklers irrigation was another type used where water moved into pipes to one or more central locations within the field and distributed by overhead high-pressure sprinklers or guns. Drip irrigation was considered one of the best techniques which had potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The drip irrigation was by far the best technique to be used and adopted since it has several positive effects on water and energy conservation. Furthermore, it was easy to install and maintain and was easily moved from one field to another, with a longevity of 30 years or more.

The irrigation methods used for agricultural purposes were surveyed in the three municipalities and three main methods used were the surface, sprinklers and drip irrigation techniques; however, the drip irrigation technique was not used in the Jdeidet Al-Chouf province but the household responders were aware of its potential use as a key means to conserve water. Surface irrigation technique was mostly practiced in both Jordan and Lebanon (Figure 17). The results from this study illustrated the importance of using project interventions and objectives to advocate key techniques that can be adopted locally to promote water conservation, enhance financial security and livelihoods within the municipality.

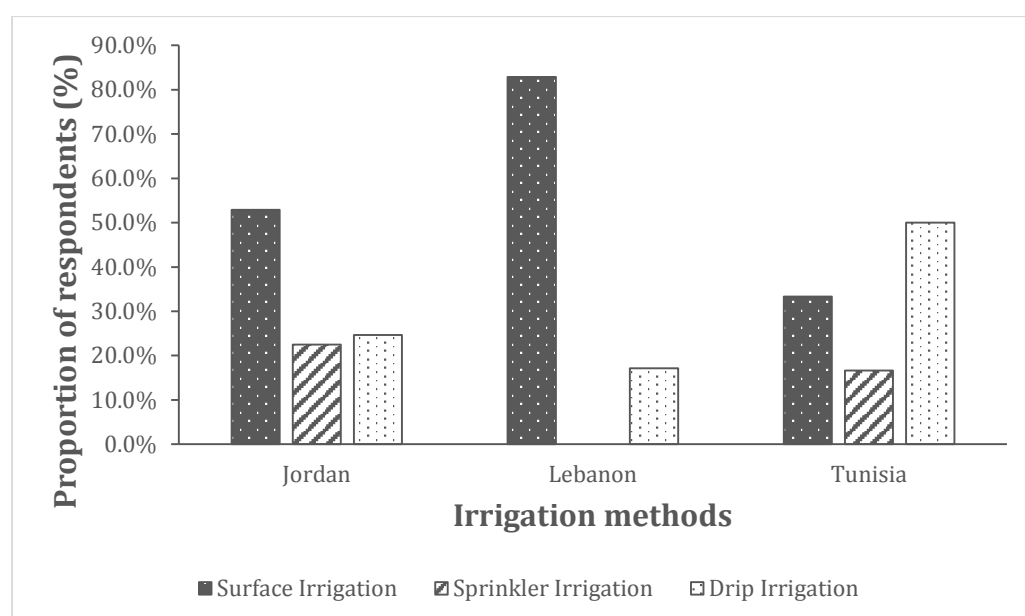


Figure 17: Irrigation methods used in the agricultural lands in the three survey sites.

3.3.2 Existing Knowledge and Practice on the household level

This section presented the findings based on the perceptions and practices of the local community with regards to water, energy and food production.

3.3.2.1 Energy sources Preferences

The consultant interviewed households within the three municipalities to understand their preferences with regards to the types of available energy sources. It was clear that people on the household level preferred the use of electricity, especially in Jordan and Tunisia; Lebanon on the other hand preferred the use of wood as the main energy source. Respondents from all three project sites did not have a preference to use solar energy (Figure 18). From these findings, it can be deduced that the MINARET project had prime importance in the project sites in terms of increasing community awareness on the NEXUS approach and providing the small initiatives to benefit both households and municipalities.

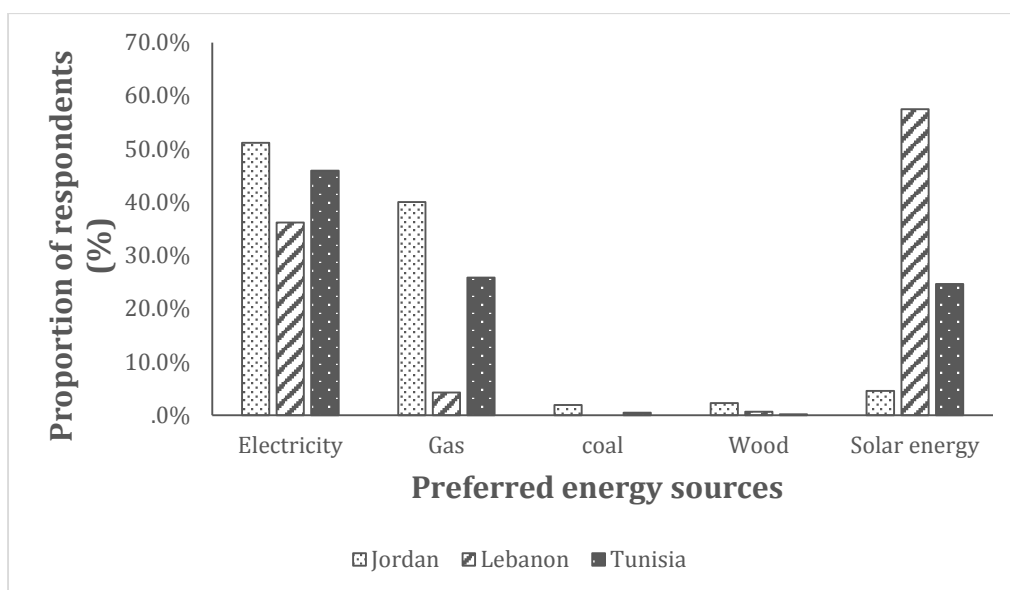


Figure 18: Preferred energy sources in the survey sites.

The study also aimed to provide clarity as to why respondents preferred certain types of energy source within their households. According to respondents from all three project sites, access to those energy sources was the main reason for their preferred energy source choice. Respondents from all three municipalities also showed interests in opting for energy saving techniques (Figure 19), that can also provide some financial savings in both the short and long terms.

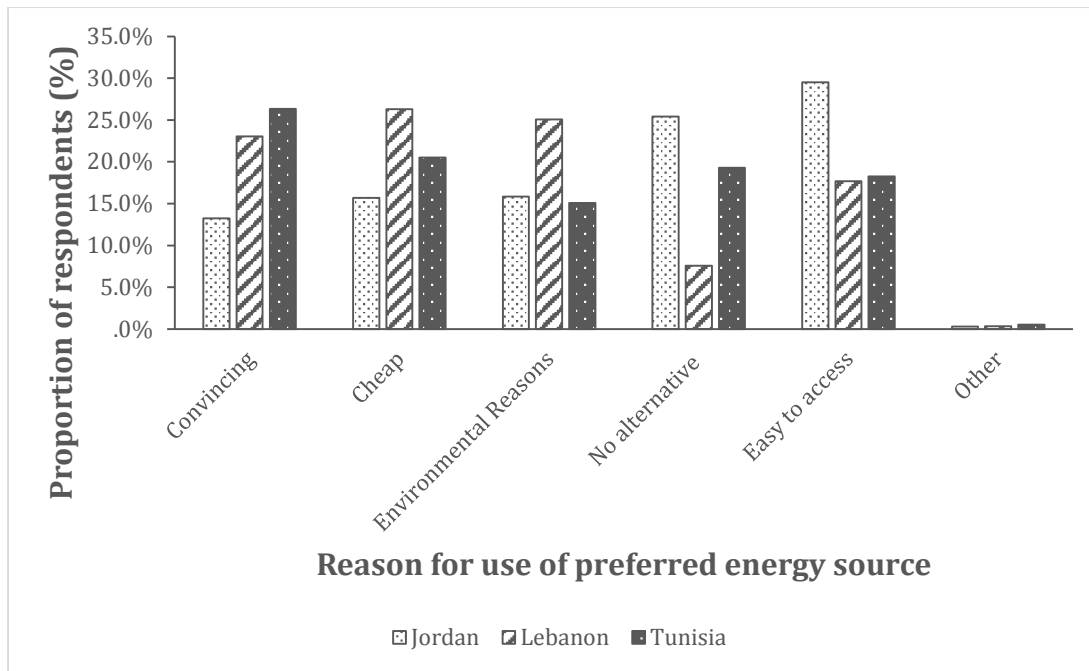


Figure 19: Reasons for use of preferred energy sources in each project site.

Results showed that financial saving was the primary reason for respondents to opt for energy saving techniques, followed by nature conservation purposes, religious, social and other reasons (Figure 20). Results from this study illustrated how adopting the NEXUS approach contributed positively to financial saving and enhanced community livelihoods.

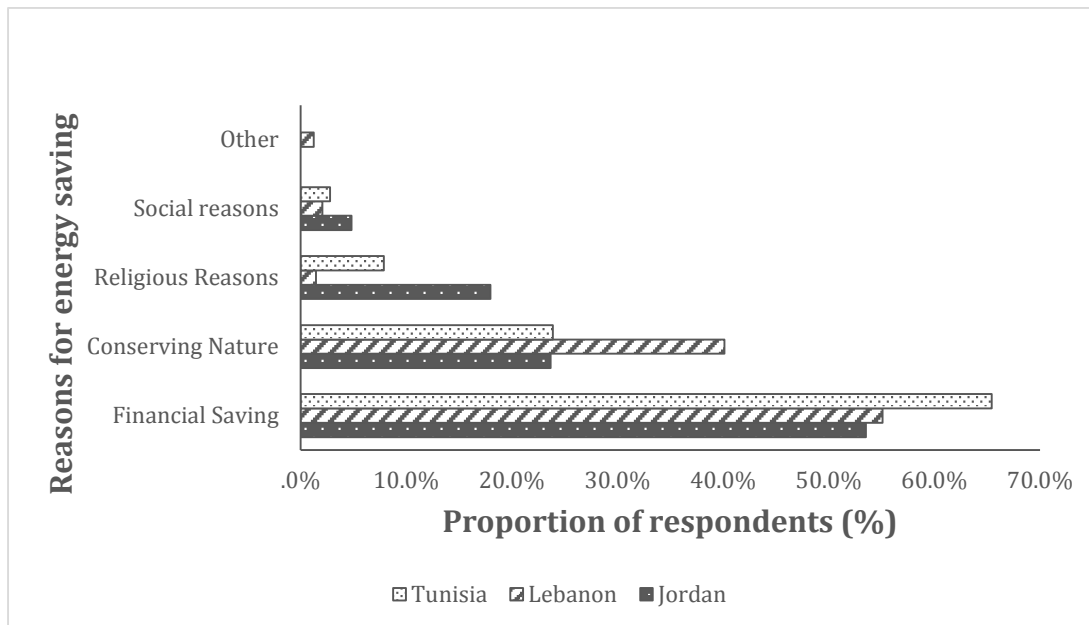


Figure 20: Reasons for energy saving among respondents in the three project sites

Moreover, the study showed that people living within the Karak Municipality were using a combination of energy saving measures, as opposed to Jdeidet Al-Chouf and Monastir municipalities. Switching off the lights when not in use was by far the most used practices toward energy saving in all municipalities (Figure 21).

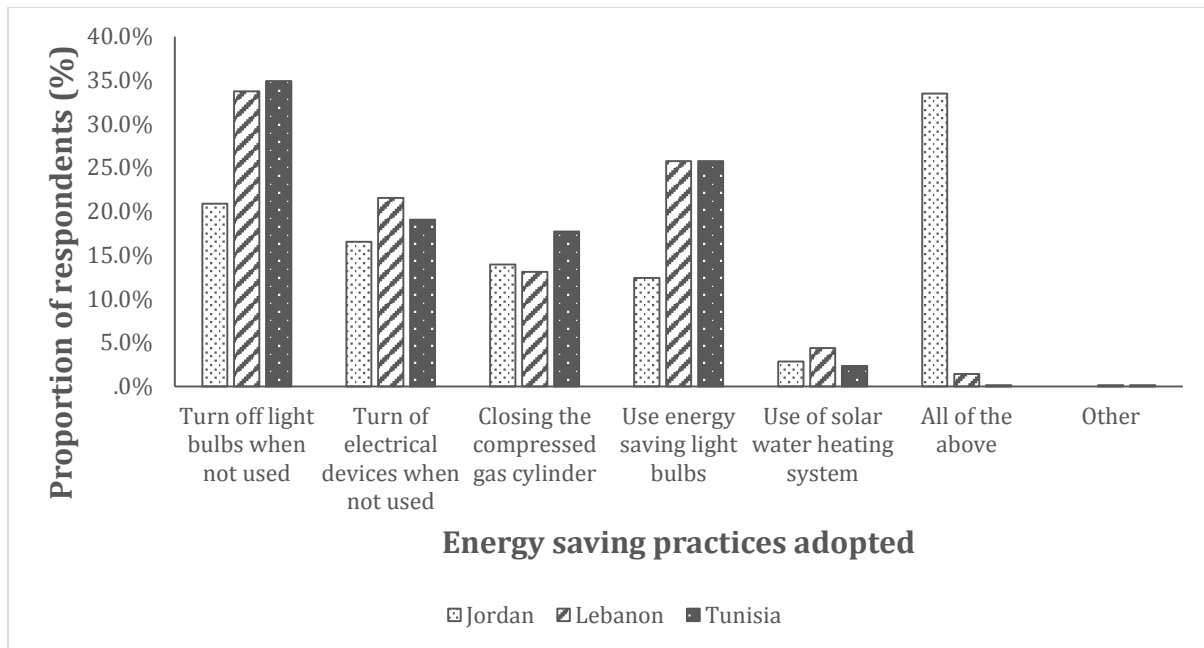


Figure 21: Energy saving practices adopted in the three project sites.

3.3.2.2 Water Resources Preferences

The majority of respondents from all 3 project sites were willing to save water to firstly reduce financial loss through wastage and secondly, for nature conservation (Figure 22).

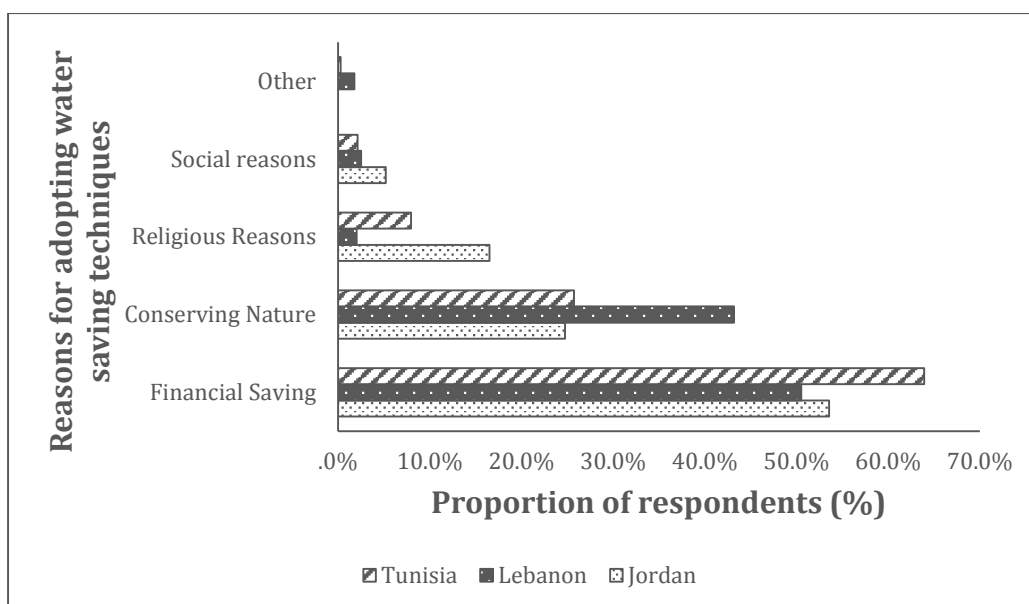


Figure 22: Reasons for adopting water saving techniques in the survey sites

It was found that people are using water saving techniques as a major water saving practices on the household level in all municipalities', where Karak Municipality was the frontrunner (69.8%) followed by Jdeidet Al-Chouf and Monastir municipalities with 45.9% and 43.2%

respectively. Awareness is also performed on the household level, but it was clearly noticed the weak usage of rainwater harvesting techniques generally in all municipalities studied (Figure 23).

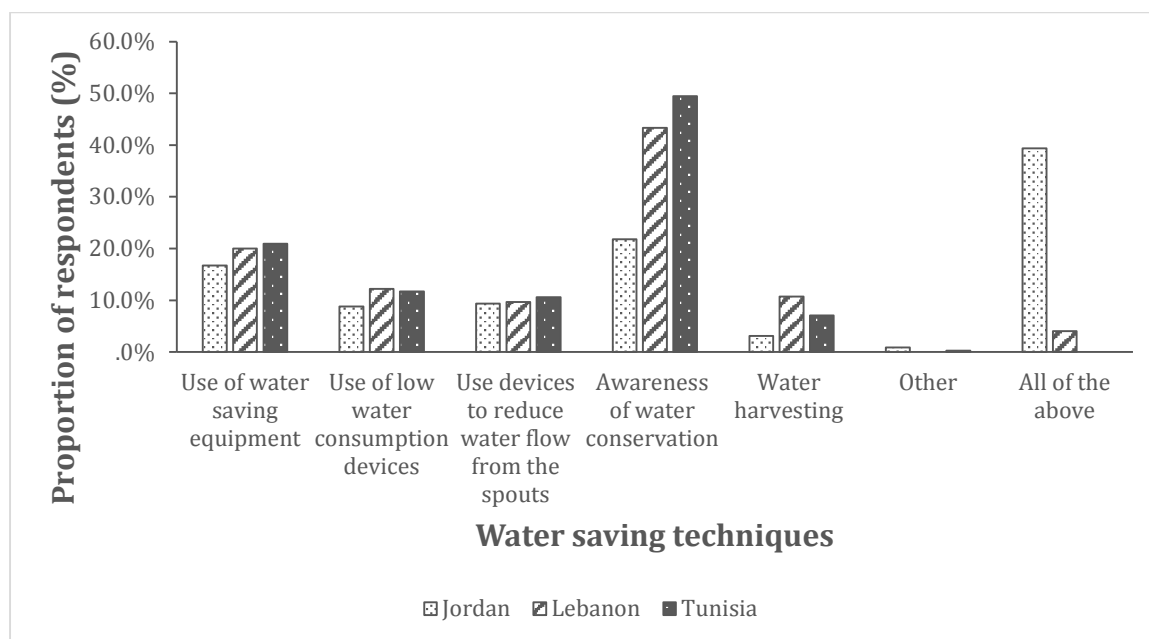


Figure 23: water saving practices adopted in the three survey sites

From the results, it can be concluded that the large family size found in the three project sites will have implications on the families' economic status and it additionally put more pressures on resources such as water, energy and food. Families living within the municipality boundaries will thus have an increasing number of trade-offs and potential conflicts among these resources which are all interlinked and drive complex interactions. Thus, effects at country level is expected if no appropriate actions and measures are taken into consideration to introduce advanced technologies and tools for water and energy conservation which will potentially positively contribute to enhanced food production and security. Understanding key socio-economic aspects influence how communities perceive resource use, environmental conservation and finance. Therefore, interventions in water and energy conservation as well as food security measures based on NEXUS approach are required to ensure stable economic and social investments in the young age categories in all municipalities surveyed.

Achieving the SDGs over the project period is vital to the three project sites in the sense that it will open doors to provide long term security for environmental and resource protection to attain sustainable development at household and municipal levels.

These can be attributed to the establishment of sustainable conditions and practices that promote inclusive and sustained local and national economic growth, shared prosperity and equal opportunities for everyone. Such forward step towards progress and good governance is vital for the Middle East and North African countries as it will provide good boost towards

development, fair treatment between and within the countries, thereby promoting political and social stability, bilateral and multilateral cooperation and human rights.

The MINARET project can contribute significantly to enhance local knowledge and awareness with regards to the NEXUS approach at the regional level. The opportunities which will be provided through the establishments of the proposed small initiatives will certainly improve families' livelihoods, irrespective of family size, earnings or reliance on solar energy for water and food security. The collective interventions proposed as well as the recommendations set will enhance people's knowledge, attitude and practices in terms of water and energy conservation means and how they could be used in sustainable food production through agricultural practices. Despite the role of the MINARET project to influence national priorities, the local government and municipalities need to set regulatory framework and standards, remove policy and political barriers, provide funding and technical assistance as well as facilitate co-ordination of activities among the various sectors and government levels to build on the project's milestones. There is also the need for the local government to integrate the NEXUS approach into national strategies, development plans and policy framework. Effective governance and a proper enabling environment which take into account human and social capacity will be essential prerequisites. A clear regime that lays out the legal rights and responsibilities for natural resources will be crucial to enable effective and successful NEXUS development.

3.4 Key Institutions & their Roles

The following provide a list of governmental and non-governmental organizations, which were active within the three surveyed municipalities

3.4.1 Institutions at Karak Municipality

3.4.1.1 Governmental Institutions

- **Greater Karak Municipality:** a governmental institution which is responsible for maintenance of infrastructure, issuing building permits, planning development projects and waste management. It has a neighbourhood committee's municipal council for communication purposes with local people.
- **Directorate of Municipal Affairs:** a governmental institution which is responsible for follow-up of municipal projects and planning, issuing licenses, blueprint and open bids
- **Agricultural Directorate in Karak:** is responsible for providing service to farmers and obtain the necessary fees through established committee which is responsible about communication
- **National Center for Agricultural Research and Development in Karak:** is responsible about providing agricultural development services, as well as the annual farmer programs

- **Water Authority Directorate of Karak:** is responsible about water distribution, sewage water grid and maintenance activities. It communicates with local people through a governorate executive committee
- **National Electricity Distribution Company:** is responsible for transmission and distribution of electricity to consumers as well as maintenance activities of the network
- **Jordan Food and Drug Administration:** is responsible for awareness of society on food safety and correct usage of medicines. Furthermore, it ensures food safety, quality and perform food laboratory tests. It can communicate with the local communities through an established General Safety Committees.
- **Karak Youth Directorate:** is responsible for encouraging the voluntary work values for youth, invest in youth and raise their knowledge and awareness to avoid any forms of extremism. They can communicate with youth through the established youth councils, or parliamentary members.
- **Department of Land and Survey in Karak:** Their key responsibility includes carrying out land transactions within the governorate including sale, ownership transfer and mortgages... etc.
- **Karak Health Directorate:** is responsible for health-related issues within the governorate. They communicate with local communities through General Safety Committees.
- **Industry and Trade Directorate in Karak:** is responsible for issuing commercial records, markets monitoring, provide feeding materials and provide flour for bakery. They communicate with local communities through General Safety Committees.
- **Directorate of Government Buildings:** is responsible for supervision of projects and follow up, as well as providing services to government buildings. They communicate with local communities through an established governorate executive committee.
- **Public Works Directorate in Karak:** is responsible for roads pavement, improvement and maintenance.
- **Agricultural Credit Corporation:** is the responsible entity for lending agricultural projects
- **Waqif Directorate in Karak:** are responsible for all religious affairs including Awqaf services, conduct preaching, guidance and mosques as well as the Hajj and Zakat services.
- **Labour Directorate in Karak:** are responsible for organization and procedures of the labour market in all disciplines
- **National Electric Power Company:** are responsible for the construction and maintenance of main power plants
- **Balqa Applied University:** is an academic institution which provides learning atmosphere for students.
- **Directorate of Education in Karak:** are responsible for the educational services and the supervision of private schools
- **Department of Statistics:** are responsible for statistical services such as the population census
- **Mu'tah University:** is an academic institution which provides learning atmosphere for students.

3.4.1.2 Non-governmental Institutions

- **Retired Militaries Personal Society:** encourages agricultural investment through the use of agricultural machinery, as well as investing money in commercial markets Marathons
- **Karak Medical Care Society:** provides medical care, networking between private and government hospitals to provide services for the local people and public awareness to halt various health problems such as smoking.
- **Princess Basma Community Development Centre:** aims for conservation of the environment and biodiversity, sustainable use of the environmental zone project, water management including performing several initiatives on water harvesting and modern irrigation methods. Furthermore, it works toward education and Training through establishing capacity building programs for women and youth.
- **Rakin Women Society:** have several initiatives regarding the solar heaters, wells and houses Maintenance. Furthermore, they provide training on computers, food industries, dairy products, Jams and drying of grain.
- **Karak Corporate for livestock herders:** are involved in several initiatives including dairy production, guidance and awareness and follow up livestock issues.
- **Women Cooperative Society:** are responsible for lending solar heaters and water harvesting tools. Furthermore, they are educating communities on several issues related to water importance. They own a tailor shop as well as a silver manufacturing workshop.
- **Sharif Cooperative Society:** offers land cultivation and support communities in renting agricultural land as well as sheep Farms.
- **Mumia Falls Society:** have interventions in eco-tourism and catering services as well as environmental conservation.
- **Meroud Society for Energy and Environment:** contributes to raise environmental awareness and education.

3.4.1.3 Services Provided at Karak Municipality

It was found that the community in Karak Municipality was well served in general and almost all essential services were available. However, attention should be paid to the majority of these which are either in need of improvement or update (Table 4).

Table 4: Services provided in Karak Municipality

| Karak Municipality in Jordan | |
|------------------------------|--|
| Electricity | Electricity is available at the municipality, but more improvement is needed to the grid, to ensure, minimize or halt the repeated cut-outs especially during summer and winter seasons. |
| Water and Wastewater Network | Water services are available, but improvement to the grid is required since the water flow is “weak and unstable” especially during summer months. Furthermore, water network is old and need maintenance. |

| | |
|--|--|
| | Regarding waste water, some areas within the municipality are not yet connected to the wastewater network. |
| Public Transportation | Public transportation is available; but a high demand exists which require better attention and management. Furthermore, the cost of public transportation is high especially that most areas at Karak are rural areas, which needs specific attention. |
| Health Services | Health services are available, but distance issues are the major challenge, which combined to expensive and weak public transportation system. Furthermore, a general lack in medical supplies is a challenge. |
| Education Services | Education services are available, but distance issues are the major challenge, which combined to expensive and weak public transportation system. Infrastructure is also a challenge since it requires maintenances and introducing technologies in water and energy conservation. |
| Communications and Internet | Services are available; but it need to be strengthened to ensure available network coverage. |
| Vocational training Centres | The services are not available |
| Entertainment programs, public Gardens and Playgrounds | The services are not available |
| Public Libraries and Cultural Programs | The services are not available |
| Handicap Services | The services are not available |

3.4.2 Institutions at Jdeidet Al-Chouf Municipality

3.4.2.1 Governmental Institutions

- **Jdaidet Al-Shouf municipality:** it is responsible for environmental work and waste management. Furthermore, it works to enhance economic and social development, management of citizens' transactions, sewage and water treatment, provide seedlings for farmers and provide biological pesticides and traps for farmers. They communicate with local people through an established neighbourhood committees and municipal council.
- **The Agricultural Center:** it is responsible for awareness raising and extension, agricultural consulting and inspection of food factories. They communicate with local people through the established agricultural cooperatives
- **Électricité Du Liban:** it is responsible for production, transmission and distribution of electricity to consumers. Furthermore, they rehabilitate the network, build distribution stations and responsible of the construction of main power plants.
- **Semqanieh Municipality:** They are responsible of infrastructure maintenance, issuing building permits, social activities, assistance at the agricultural level and planning development projects. They communicate with the local communities through the neighbourhood committees, associations and clubs.

- **The Development Services Center in Al-Mokhtara:** They are responsible of social and health services, perform clubs for children and Elderly, literacy education, women's training courses and education as well as disabled services.

3.4.2.2 Non-governmental Institutions

- **LNA Youth Association:** They are responsible of conducting need assessment studies, communicate and coordinate with municipalities. Furthermore, they perform awareness campaigns in schools against smoking, drugs and alcohol as well as performing various activities in support of marriage projects, environmental activities, marriage encouragement project, scholarship project and Marathons.
- **Al - Jdaideh Women's Association:** They are responsible of supporting student at schools with books and supplies when needed, humanitarian issues and entertainment activities such as exhibitions. Furthermore, they provide electricity generator at some occasions.
- **Women's Liberal Union:** They offer various training courses such as sewing, drawing on fabrics, makeup, bamboo and flower arrangement. Furthermore, they organize children's activities such as the summer clubs.
- **The Shouf Cedar Association:** They perform ecotourism activities, environmental awareness research and evaluation

3.4.2.3 Services Provided at Jdeidet Al-Chouf Municipality

It was found that the community in Jdeidet Al-Chouf municipality is well served in general and almost all necessary services are available. However, attention should be paid to the majority of these in means of improvements and update (Table 5).

Table 5: Services provided in Jdeidet Al-Chouf municipality

| Jdeidet Al-Chouf municipality in Lebanon | |
|--|---|
| Electricity | Electricity is available, but the main challenge is as a consequence of ration. i This has resulted in the dependency of the local communities on private electricity generators, which add more financial pressures on local communities and created more pollution to the atmosphere. |
| Water and Wastewater Network | The water services are available. However, water flow is "weak and unstable" especially throughout the summer months. |
| Public Transportation | Public transportation is available; however, the main issue associated with this service is the high demand and lack of available busses and taxis to meet that, the traffic jams and delays. Furthermore, roads are not suitable and require serious maintenances. |
| Health Services | Health services are available but the cost is high especially with the absence of insurance to many local people. |

| | |
|--|---|
| Education Services | Education services are available but high education is very limited. |
| Communications and Internet | Services are available; but issues related to the coverage exists especially for the internet connection. |
| Entertainment programs, public Gardens and Playgrounds | The services are not available |
| Public Libraries and Cultural Programs | The services are not available |
| handicap Services | The services are not available |

3.4.3 Institutions at Monastir Municipality

3.4.3.1 Governmental Institutions

- **Société Nationale d'Exploitation et de Distribution des Eaux-SONEDE:** They are responsible for the production and distribution of drinking water and supply it to the whole municipality areas, upgrading of collection and distribution grid, maintain water storage capacity and periodic maintenance of the public water grid. They communicate with local people through councils.
- **ONAS - Office National de l'Assainissement:** They are responsible to control all forms of water pollution, Management, maintenance, renovation and construction of all sanitation structures and oversee the sanitation products sector. Furthermore, they are planning and implementing sanitation projects and responsible for the preparation and implementation of integrated projects related to wastewater treatment and storm water drainage. They communicate with local people through councils.
- **Commissariat Regional au Developement Agricole:** They are responsible for the implementation of legal and regulatory procedures relating to the responsibilities of commission, mainly the protection of agricultural lands forests, water, animal health and plant protection. Furthermore, they have a role in the protection and development of forest resources, conservation of water and soil and water irrigation and distribution as well as performing agricultural studies and statistics
- **Commissariats Régionaux au Développement Agricole:** the "Regional Commissariat for Agricultural Development" is placed under the supervision of the Ministry of Agriculture. It is responsible, within the framework of the governorate, for the implementation of the agricultural policy adopted by the Government.
- **Centre d'Affaires de Monastir:** The Economic Public Interest Business Center is used to carry out activities designed to facilitate the realization of projects and to provide the necessary services to promoters and investors to launch or develop their projects. Its target is Proponents who are graduates or those with a sufficient level of aptitude, project promoters and promoters in the context of the spin-off
- **National Agency of Environment Protection:** it aims to participate in the development of the general policy of the Government in the fight against pollution and environmental protection and its implementation through specific actions and sectoral and global actions in the context the National Development Plan.

3.4.3.2 Non-governmental Institutions

- **Environment Ambassadors:** They are responsible for the afforestation campaigns, participation in the celebration of the International Day of Museums and Scientific Centres, environmental conservation Awareness activities and decorating schools
- **Youth and Science Club:** They are responsible for encourage young people to engage in scientific and technical activities, work for scientific and technological culture among the general public, launch of "Lab Club" for youth and pilot training courses in scientific and technical school activities.
- **Rospina Society for Environment and Sustainable Development:** They are responsible for organizing social cultural charity activity under the slogan «urge to read», cleaning awareness and campaigns and the collection of bottle caps.
- **Rotary club de Monastir:** They are responsible for drawing contest and they contribute positively in the blood donation day
- **Notre Grand Bleu:** They work toward marine environment protection, perform environmental awareness campaign in schools and work on the recovery of the ecosystems and encounter global warming. Furthermore, they have efforts in rationalization of energy consumption.
- **Voice of the Children's Association:** They educate the low-income mothers and train illiterate women a handcraft to fight poverty

3.4.3.3 Services Provided at Monastir Municipality

It was found that the community in Monastir municipality was well served in general and almost all necessary services available. However, attention should be paid to the majority of these in terms of improvements and update (Table 6).

Table 6: Services provided in Monastir municipality

| Monastir municipality in Tunisia | |
|----------------------------------|--|
| Electricity | Electricity is available at the municipality, but more improvements is needed to the grid, to ensure minimizing or halting the repeated cut-outs especially during summer and winter seasons. |
| Water and Wastewater Network | Water services are available, but improvements to the grid is required especially that the water flow is "weak and unstable" especially during summer months. Furthermore, water network is old and need maintenance. Regarding the waste water, some areas within the municipality are not severed yet with wastewater network |
| Public Transportation | Public transportation is available; however, the main issue associated with this service is the high demand and lack of available busses and taxis to meet that, the traffic jams and delays. |

| | |
|---|--|
| Health Services | Health services are available but a general lack in medical stuff is considered a challenge. |
| Education Services | Education services are available, but distance issues are the major challenge, which combined to expensive and weak public transportation system. Infrastructure is also a challenge since it requires maintenances and introducing technologies in water and energy conservation. |
| Communications and Internet | Services are available; but issues related to the coverage exists especially for the internet connection |
| Vocational training Centres | The services are not available |
| Entertainment programs and public Gardens and Playgrounds | The services are not available |
| Public Libraries and Cultural Programs | The services are not available |
| Handicap Services | The services are not available |

3.5 Initiatives Proposed in the Targeted Municipalities

3.5.1 Initiatives at Karak Municipality

Three initiatives were included which could be applied in Karak Municipality, though it is recommended to apply the third initiative in Sahab to support the accomplishment performed in the previous project. More initiatives are listed in Annex VII.

3.5.1.1 Initiative One: Eco- tourism Product Development

Overview

Eco tourism is a growing concept in Jordan and main governmental institutions are working toward institutionalizing the concept as an integral part in its departments. Karak is very unique in terms of ecosystems and habitats and contain important wadis system that discharge in the Dead Sea. An initiative has been actioned by the Jordanian Hashemite Fund for Human Development (JOHUD) and supported by the Sustainable use of ecosystem services in Jordan – Energy and Climate Fund (EKF-ESS) project which is commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) through GIZ. This project could be used as a base for the MINARET to interfere and build on the existing achievement as a means of rehabilitating of the current eco- lodge. This should contribute positively to the local communities and thus support and attain the NEXUS approach as adopted in the MINARET project.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs):

- JOHUD which can act as a supervisor

- Momya Waterfalls society: Eco- tourism development partner
- Rakeen Women Society: traditional food supplier partner
- Women Cooperative Society): packaging partner.
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Project facilitation and supervision

Process

Project funding is delivered through a grant to the implementing partner under the supervision of JOHUD. The infrastructure development are initiated as a start point, through funds provided by the MINARET project. The fund will be used to operate a gay water systems, which will be connected to a small-scale orchard planted with lemons and oranges. Products produced by the orchard will be handled and sold at the visitor centre e on site. Furthermore, part of the fund will be directed to install solar panels which will provide electricity for the site. The site could be equipped with a small dining room for visitors using the traditional food supplying partners. It is important to establish good connection and communication channels between the food supplying partners and the packaging partners, who will use the recycled materials during the packaging system. This project thus contribute to support the nexus approach S since all sectors are handled accordingly, namely water, energy and food.

Training needs

It is highly recommended to conduct training courses on the following key aspects for the project partners.

- 1- Eco-tourism and tour guiding
- 2- Eco-packaging
- 3- Food safety and quality
- 4- Food processing

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

1. **SDG6** “Ensure availability and sustainable management of water and sanitation for all”: Access to safe water and sanitation and sound management of freshwater ecosystems are essential to human health and to environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
2. **SDG7** “Ensure access to affordable, reliable, sustainable and modern energy for all”: Meaningful improvements of energy will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:

- **7.1 (7.1.1 and 7.1.2):** By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1):** By 2030, increase substantially the share of renewable energy in the global energy mix
3. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Planetary warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the State of the Global Climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

3.5.1.2 Revolving fund program

Overview

The Revolving Fund is a program which provides funding for household and individuals within the municipality boundaries that wish to undertake any activities related to Energy, Water and food security. Funding is provided in the form of a low or no-interest rate loan that is to be repaid within an approved number of years or months by the Project Management Unit (PMU) or a selected partner NGO. Funds may be accessed through a competitive application process which must be supported by a strong business case. The revolving fund is designed to:

- Reduce the environmental impacts.
- Improve household’s economic conditions.
- Remove any excuse or weakness (e.g. lack of funding) for beneficial projects with longer term paybacks

Type of applicable initiatives

- 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 greywater systems at households
- Replacement of household bulbs to LED bulbs
- Rain water harvesting wells
- Drip irrigation system installation

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Rakeen Women Society: Potential leader
- Women Cooperative Society: Potential implementing partner.
- Retired Militaries Society: Potential implementing partner.
- Al Shareef Cooperative society: Potential implementing partner.
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Project facilitation and supervision

Process

Funding is delivered through a competitive application process. The maximum and minimum loan range shall be announced, where applications will be accepted based on merits and meeting all criteria. A loan agreement shall be signed, where individuals obtain loans to undertake the proposed activity at household or in the agricultural lands they own. Application forms can be obtained from the selected implementing partner. This should be followed by submitting the completed application form together with a certified copy of the beneficiary ID and latest pay slip or proof of income. Successful applications will be notified in writing as well as telephonically by the responsible authority.

Training Needs

The initiative is easily managed and only requires financial training in loan management. Furthermore, official documentations related to the loan shall be developed and prepared. The suggested entities shall be capable of executing the initiative directly.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

1. **SDG7** *“Ensure access to affordable, reliable, sustainable and modern energy for all”*: Meaningful improvements of energy will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
2. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Planetary warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the State of the Global Climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

3.5.1.3 Herbal and medicinal plants production and packaging

Overview

Although this initiative could be applied in Karak municipality, the team recommended its application in other Sahab areas.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- All women NGOS
- Sahab Municipality/ development unit: Facilitation and Supervision
- MENARET Project Management Unit (PMU): Facilitation and Supervision

Process

Project funding is delivered through a grant to the implementing partner to install a greywater system in Sahab big Mosque. Water drained will be used to irrigate four green houses in the adjacent piece of land that is provided for the project. The greenhouses will be bought and installed by funds from the MINARET project, in addition to a drip irrigation system and solar panels that will run the irrigation pumps. The plastic houses will be planted with the medicinal and herbal plants. The entire product will be handled by women NGOs; they will do the processing, cleaning and packaging. The municipality will provide a small place with the municipality premises for showing and selling of the dried packaged products

Training Needs

The initiative is complex and need a good governance between the partners. The training needs for this initiative are

- 1- Herbal and medicinal plant agriculture (planting and production)
- 2- Food safety and quality
- 3- Food processing
- 4- Packaging and marketing

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

1. **SDG2** “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”: Efforts to combat hunger and malnutrition have advanced significantly since 2000. Ending hunger, food insecurity and malnutrition for all, however, will require continued and focused efforts, especially in Asia and Africa. Furthermore, this initiative will contribute to:

- **2.1 (2.1.2):** By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
 - **2.5 (2.5.1):** By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
2. **SDG6** “Ensure availability and sustainable management of water and sanitation for all”: Access to safe water and sanitation and sound management of freshwater ecosystems are essential to human health and to environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
- **6.2 (6.2.1):** By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1):** Support and strengthen the participation of local communities in improving water and sanitation management
3. **SDG13** “Take urgent action to combat climate change and its impacts”: Planetary warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the State of the Global Climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
- **13.3 (13.3.1 and 13.3.2):** Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
 - **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

3.5.2 Initiatives at Jdeidet Al-Chouf Municipality

3.5.2.1 Solar farm model

Overview

Solar farm is a large-scale solar panels system designed for the supply of merchant power into the electricity grid to power thousands of homes, businesses and infrastructures. The solar power source is via photovoltaic modules that convert light directly to electricity. The photovoltaic (PV) cells made of silicon are constructed into panels, each gathering a small amount of sunlight energy. The panels are installed on short towers over an area as big as 0.5Km². Multiple panels are required to generate significant electricity, which is why solar panel farm arrays are so large.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Al-Jdaideh Women Society: Potential implementing partner
- Jdaidet Shouf Municipality: Facilitation and Supervision
- MENARET Project Management Unit (PMU): Facilitation and Supervision

Process

A land area is required for the desired power Solar Farm output. Selection of the land will depend on the slope, ownership, efficiency of the solar modules and the type of mounting used. It is highly recommended to avoid any economical feasible lands to avoid any conflict over its use and to search for a brown field sites. The suggested partner is Al-Jdaideh Women Society, which is running now a fossil fuel generator project. Their project generates electricity, which is distributed to consumers. Therefore, they have enough experience to run the suggested initiative. The MINARET project will provide funds to install the solar farm panels. The size is dependent on the amount of available funds, land provided by the partner and the power capacity needed.

The suggested partner will run the solar farm and distribute the generated electricity to consumers either as a substitute to the fossil fuel generator or as a supplement, in either case the generated revenue shall be accumulated and used to provide funding for local community for:

1. Household's food processing activities
2. Maintenance of household's water Plumbing
3. Installation of grey water systems at households
4. Replacement of household bulbs to LED bulbs
5. Installation of Solar water heater
6. Installation of solar panels for households
7. Rain water harvesting wells
8. Drip irrigation system installation

At this point it is advisable to start giving microloans to beneficiaries with a maximum of 500 USD and that is because of the low capacity for the implementing partner, after that the ceiling can be raised depending on the cumulative experience. The project should be run under a very clear MOA between MINARET and the implementing partner that states clearly the roles and responsibilities for each partner and it is advised to engage the Municipality with that regard to gain more official power and more commitment of the implementing partner

For solar panels lifespan it is known to be 25 years and for the project is expected to last for that duration and to be productive through it, the estimated cost for the installation of the farm would around 25000 USD that will come all from the MINARET project, depending on the seasonality and the weather conditions the average expected revenue will be around 1000 USD, which will return the invested capital within 25 months from the operation date.

At this point it is hard to come up with an estimate of the number of beneficiaries as the funding is coming and accumulated from two ways:

1. Revenue generated from the farm
2. Loans payments

But giving only the expected revenue monthly there will be 24 beneficiaries each multiplied by 4 years of MINARET implementation and the number will be 96 beneficiaries or households

Training Needs

Regardless of the complexity of the initiative, the suggested partners have a good experience in running similar projects, which will facilitate the distribution of electricity and the collection of bills, yet still they need:

- Training on maintenance of the solar panels.
- Financial training on loan management
- Plumbing Vocational Training.
- Grey Water Systems installation.

3.5.2.2 Revolving fund program

Overview

The Revolving Fund is a program which provides funding for household and individuals within the municipality boundaries that wish to undertake any activities related to Energy, Water and food security. The funding is provided in the form of a low or no-interest rate loan that is to be repaid within an approved number of years or months by the Project Management Unit (PMU) or a selected partner NGO. Funds may be accessed through a competitive application process which must be supported by a strong business case. The revolving fund is designed to:

- Reduce the environmental impacts.
- Improve household's economic conditions.
- Remove any excuse or weakness (e.g. lack of funding) for beneficial projects with longer term paybacks

Type of applicable initiatives

- 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 grey water systems at households
- Replacement of household bulbs to LED bulbs
- Rain water harvesting wells
- Drip irrigation system installation

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Al-Jdaideh Women Society: Potential implementing partner
- LNA Youth Society: Potential implementing partner.
- Women's Liberal Union: Potential implementing partner.
- Jdaidet Shouf Municipality: Facilitation and Supervision
- MENARET Project Management Unit (PMU): Facilitation and Supervision

Process

Funding is delivered through a competitive application process. The maximum and minimum loan range shall be announced, where applications will be accepted based on. A loan agreement shall be signed, where individuals obtain loans to undertake the proposed activity at household or in the agricultural lands they own. Application forms can be obtained from the selected implementing partner. This should be followed by submitting the completed application form together with a certified copy of the beneficiary ID and latest pay slip or proof of income. Successful applications will be notified in writing as well as telephonically by the responsible authority.

Training Needs

The initiative is easily managed and only requires financial training in loan management. Furthermore, official documentations related to the loan shall be developed and prepared. The suggested entities shall be capable of executing the initiative directly.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

3. **SDG7** *"Ensure access to affordable, reliable, sustainable and modern energy for all"*: Meaningful improvements of energy will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
4. **SDG13** *"Take urgent action to combat climate change and its impacts"*: Planetary warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the State of the Global Climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small

island developing States, including focusing on women, youth and local and marginalized communities

3.5.3 Initiatives at Monastir Municipality

3.5.3.1 Solar (Photovoltaic) Panels in Ecotourism

Overview

Tourism is an important sector in Monastir as it is considered a major tourist resort with many tourism activities including ecotourism activities. The Idea is to develop tourism activities that combine nature conservation with food and energy and link it to the livelihoods of the local communities.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Notre Grand Bleu: the main implementing partner.
- Voice of the Children's: implementing partner.
- Business entrepreneur association: implementing partner.
- Monastire Municipality: Facilitation and Supervision
- MENARET Project Management Unit (PMU): Facilitation and Supervision

Process

Project funding is delivered through a grant to the implementing partner. Two sites will be developed and rehabilitated including a site located in the Monastir port and the other site lies in an island called Kuriat.

The Notre Grand Bleu own a site within the Monastir port site; which was donated to them from the government. The site will be rehabilitated to act as a nature Hub, visitor and training centre. The training provided at the centre will focus mainly on the marine conservation and capacity building in energy and water management subjects. The visitor centre part will have a nature shop that sell products coming from other partners, where the voice of the Children's association will provide food and traditional Tunisian sweets, recycled handcrafts products and the eco-fishing nets. The other partner Business entrepreneur association through one of his trained entrepreneurs will provide pots products and natural colours coming from olive oil extraction wastewater.

On the Kuriat island the project will help in establishing a wooden cottage and a solar panel to provide researcher with needed electricity to carry out research on the island, the researchers are those from Notre Grand Bleu or university students taking training course in the training centre. The project will provide a boat that runs by the solar energy and that will take researchers and visitor to Kuriat Island.

Training Needs

This initiative is complicated and need efforts, management and commitments. The following trainings are needed.

1. Financial training on grants management.
2. Projects management and reporting
3. special training in the simple maintenance of the solar system
4. ecotourism
5. eco-fishing and nets manufacturing

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

1. **SDG7** *“Ensure access to affordable, reliable, sustainable and modern energy for all”*: Meaningful improvements of energy will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
2. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Planetary warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the State of the Global Climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

3.5.3.2 Revolving fund program

Overview

The Revolving Fund is a program which provides funding for household and individuals within the municipality boundaries that wish to undertake any activities related to Energy, Water and food security. The funding is provided in the form of a low or no-interest rate loan that is to be repaid within an approved number of years or months by the Project Management Unit (PMU) or a selected partner NGO. Funds may be accessed through a competitive application process which must be supported by a strong business case. The revolving fund is designed to:

- Reduce the environmental impacts.
- Improve household's economic conditions.

- Remove any excuse or weakness (e.g. lack of funding) for beneficial projects with longer term paybacks

Type of applicable initiatives

- 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 grey water systems at households
- Replacement of household bulbs to LED bulbs
- Rain water harvesting wells
- Drip irrigation system installation

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Notre Grand Bleu: Potential implementing partner.
- Environment Ambassadors: Potential implementing partner
- Rospina Society for Environment and Sustainable Development: Potential implementing partner.
- Monastire Municipality: Facilitation and Supervision
- MENARET Project Management Unit (PMU): Facilitation and Supervision

Process

Funding is delivered through a competitive application process. The maximum and minimum loan range shall be announced, where applications will be accepted based on. A loan agreement shall be signed, where individuals obtain loans to undertake the proposed activity at household or in the agricultural lands they own. Application forms can be obtained from the selected implementing partner. This should be followed by submitting the completed application form together with a certified copy of the beneficiary ID and latest pay slip or proof of income. Successful applications will be notified in writing as well as telephonically by the responsible authority.

Training Needs

The initiative is easily managed and only requires financial training in loan management. Furthermore, official documentations related to the loan shall be developed and prepared. The suggested entities shall be capable of executing the initiative directly.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

3. **SDG7** “Ensure access to affordable, reliable, sustainable and modern energy for all”: Meaningful improvements of energy will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
4. **SDG13** “Take urgent action to combat climate change and its impacts”: Planetary warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the State of the Global Climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

3.6 Conclusion and Recommendations

The Nexus Approach to the sustainable management of water, energy and food integrates environmental management and governance across different sectors and is based on the understanding that environmental resources are inextricably tangled. As these components have mutual dependencies, they can therefore the overall resource efficiency and ensure equitable benefit sharing. Furthermore, reducing the use, recycling and reuse of resources is at the core of the Nexus Approach. Humans’ impact on the planet is altering the flow of energy, food and water and harm ecosystems, thereby diminishing their capacity to deliver ecological goods and services. As a result of environmental degradation, food and water insecurities are already increasing in many parts of the world. These insecurities will be further aggravated by global demographics (e.g., population growth), climate change and increasing urbanization. Population growth and urbanization increase the demand for crops, forest products, water and energy. As a consequence of such developments, land cover is changing worldwide and is often associated with degradation of soil and water resources, loss of biodiversity, greenhouse gas (GHG) emissions and pollution.

A Nexus approach can support the diversification and eventual transition to Green Economy, which aims, among other things, at resource use efficiency and greater policy coherence. Furthermore, it will contribute to innovative and affordable local actions that will positively contribute to improved social, economic and environmental benefits. A major conclusion of this study was that the MINARET project managed to achieve all SDGs set in the proposal document. All activities were successfully implemented including the proposed small initiatives. However, the consultant found that this project made significant contribution to the Sustainable Development Goal 17 “**SDG 17: Partnership for the Goal**” where it fully supported four sub- components, namely:

1. **Finance** and includes SDG 17.1 that entitles *“Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection”*, SDG 17.3 which state *“Mobilize additional financial resources for developing countries from multiple sources”* and SDG 17.5 which state *“Adopt and implement investment promotion regimes for least developed countries”*.
2. **Technology** and includes 17.6 *“Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level and through a global technology facilitation mechanism”* and 17.7 *“Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed”*
3. **Capacity Building** and includes 17.9 *“Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation”*
4. **Systematic Issues** and include 17.16 *“Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries”* and 17.17 *“Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships”*

Achieving the SDGs over the project period is vital to the three project sites in the sense that it will open doors to provide long term security for environmental and resource protection to attain sustainable development at household and municipal levels. These can be attributed to the establishment of sustainable conditions and practices that promote inclusive and sustained local and national economic growth, shared prosperity and equal opportunities for everyone. Such forward step towards progress and good governance is vital for the Middle East and North African countries as it will provide good boost towards development, fair treatment between and within the countries, thereby promoting political and social stability, bilateral and multilateral cooperation and human rights.

The MINARET project can contribute significantly to enhance local knowledge and awareness with regards to the NEXUS approach at the regional level. The opportunities which will be provided through the establishments of the proposed small initiatives will certainly improve families' livelihoods,, irrespective of family size, earnings or reliance on solar energy for water and food security. The collective interventions proposed as well as the recommendations set will enhance people's knowledge, attitude and practices in terms of water and energy conservation means and how they could be used in sustainable food production through agricultural practices.

Despite the role of the MINARET project to influence national priorities, the local government and municipalities need to set regulatory framework and standards, remove policy and political barriers, provide funding and technical assistance as well as facilitate co-ordination of activities among the various sectors and government levels to build on the project's milestones. There is also the need for the local government to integrate the NEXUS approach into national strategies, development plans and policy framework. Effective governance and a proper enabling environment which take into account human and social capacity will be essential prerequisites. A clear regime that lays out the legal rights and responsibilities for natural resources will be crucial to enable effective and successful NEXUS development.

At the regional level, it is important to expand and replicate this project in adjacent countries in order to share knowledge, promote sustainable use of current resources and practice cleaner technologies for maximum yield at reduced economic costs.. However, for this ideal to be possible and attainable, the effective coordination between the involved municipalities is strongly required. Local government can play a crucial role in raising awareness and enhancing people's knowledge, which in turn can support the efforts or set by the MINARET project. This could be done by collecting data on agricultural production, energy generation, water supply and sanitation, improvement of water quality and the status of aquatic ecosystems. Furthermore, decision-making processes related to the NEXUS approach should be supported by conducting risk assessment analyses on water, energy and food security. Stakeholder engagement across the NEXUS sectors can also be helpful in influencing policy making in order to secure political and social buy-ins and enhance accountability as well as transparency.

The following are general recommendations to enhance the NEXUS approach at national and regional level through the MINARET project

1. Raising awareness and disseminating knowledge about NEXUS approach based on key project findings and lessons learnt.
2. Improving the harmonization of public policies to meet national needs.
3. Examining the link between water and energy security and how sustainable practices and use of these resources can positively influence community affluence and promote environmental conservation.
4. Improving efficiency in terms of diversifying sources of energy and available water supplies and mainstream accordingly in the food production sector.
5. Increasing knowledge of clean technology choices that promote sustainable development.
6. Exchange of best practices and technology transfer
7. Promoting the adoption and use of renewable energy sources and technologies.

Annex I: The SWOT analysis of Karak Municipality, Jordan

| Strengths | Weaknesses |
|--|---|
| <ul style="list-style-type: none"> • Skilled labour force. • Availability of water source. • Availability of agricultural land • Lots of sunshine and good wind speed that can be used as alternative energy sources. • Local agricultural experts with several years of experience. | <ul style="list-style-type: none"> • Limited baseline studies and local plans. • Limited sources of funding • Poor marketing plans and strategies. • Misuse of key resources such as water. • Poor local coordination in terms of national initiatives. • Limited involvement of the private sector. • No enabling environment to encourage investment in environmental aspects. |
| Opportunities | Threats |
| <ul style="list-style-type: none"> • Increasing demand for goods and services • Good support network for local projects. • Availability of training courses and guidance in understanding resource use and management. • Presence of permanent functional sectoral organizations. • Opportunity for financial loan to be used in agriculture. | <ul style="list-style-type: none"> • Prevalence of and longer drought periods as a result of climate change. • Increased population and rate of migration between and within municipalities. • • Political and economic situations in the neighbouring countries • Urbanization • Rising cost of energy supplies. |

Annex II: The SWOT analysis of Jdeidet Al-Chouf municipality, Lebanon

| Strengths | Weaknesses |
|---|---|
| <ul style="list-style-type: none"> • High level of literacy. Availability of natural resources. • The active culture of the community. • The voluntary work ethics.. • Strong support and network of private sector | <ul style="list-style-type: none"> • Shortage of skilled and trained labours. • The local traditions impact on decision and policy making processes to some extent. |
| Opportunities | Threats |
| <ul style="list-style-type: none"> • Enhanced knowledge and skillset through the MINARET project • The presence of a supportive municipality administration | <ul style="list-style-type: none"> • Policies, regulations and laws are not in compliance with economic and social activities. |

Annex III: The SWOT analysis of Monastir municipality, Tunisia

| Strengths | Weaknesses |
|--|--|
| <ul style="list-style-type: none"> • No food problems • Excellent power and water grids • Low cost of filtered drinking water | <ul style="list-style-type: none"> • Use and state of infrastructure in some areas. Limited knowledge in making use of alternative renewable energy sources and rainwater for local consumption. • High cost incurred for use of electricity and gas |
| <ul style="list-style-type: none"> • Opportunities | <ul style="list-style-type: none"> • Threats |
| <ul style="list-style-type: none"> • Availability of external support and funding • Availability of renewable energy sources. | <ul style="list-style-type: none"> • Climate change • Increasing population • The political instability within and around the country. |

Annex IV: More initiatives proposed in the selected municipalities

Small initiatives in Jordan

Based on the study findings of Jordan, a set of small initiatives were proposed, which could be applied at household or individual's levels.

Initiative I

Solar Revolving Fund (SRF):

Description

The Revolving Fund is a program which provides funding for household and individuals within the municipality boundaries who wish to undertake solar energy/green initiatives. Solar revolving funds have supported solar energy initiatives in countries such as Namibi and several states in the USA, with the potential of knowledge sharing and adopting best practices to maximise funds for greater benefits. The funding is provided in the form of a low or no-interest rate loan that is to be repaid within an approved number of years or months by the Project Management Unit (PMU) or a selected partner NGO. Funds may be accessed through a competitive application process which must be supported by a strong business case. The revolving fund is designed to:

- Reduce the environmental impacts by reducing the consumption of fossil fuel..
- Improve household's economic conditions by reducing household's energy bill through adoption of alternative clean energy technologies.
- Remove any excuse or weakness (e.g. lack of funding) for beneficial projects with longer term paybacks.

Type of solar initiatives applicable

- **Solar Home System (SHS):** has the capacity to power lights and devices such as radios, TVs, fridges and cell phone chargers.
- **Solar Water Heater (SWH):** uses solar energy to heat water for domestic use.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs):

- Rakeen Women Society (جمعية سيدات راكين): Potential implementing partner
- Women Cooperative Society (جمعية المرأة التعاونية): Potential implementing partner.
- Retired Militaries Society (جمعية المتقاعدين العسكريين): Potential implementing partner.
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Facilitation, supervision and overall oversights for all project activities and timeline.

Process

Funding is delivered through a competitive application process. The maximum and minimum loan range will be announced, where applications will be accepted based on merit and meeting appropriate criteria. A loan agreement will be signed, where individuals obtain loans to purchase renewable energy technology products for household or economic (agricultural lands operation) uses. Application forms can be obtained from the selected implementing partner(s). This should be followed by submitting the completed application form together with a certified copy of the beneficiary ID and latest pay slip or proof of income. Successful applications will be notified in writing as well as telephonically by the responsible authority following proposal assessment and approval.

Project Reporting

The beneficiary of the loan must provide within 90 days a complete project proposal to the implementing partner, inclusive of but not limited to:

- A brief review of the project's success or challenges.
- Updated estimates of current and future savings.
- Other relevant details that tie the project to the funding objectives.
-

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implement:

5. **SDG7** *"Ensure access to affordable, reliable, sustainable and modern energy for all"*: Alternating to cleaner and improved energy sources require sufficient capital investment and sound policy framework that showcase the country's willingness and acceptance of new and improved technologies that will not only make financial saving but also further environmental protection. Such initiative will also assist in attaining the following SDG objectives:
6.
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
7. **SDG13** *"Take urgent action to combat climate change and its impacts"*: Global warming impacts were still felt in 2016 and according to the World Meteorological Organization's statement on the state of the global climate (WMO), a new increased temperature record of about 1.1 degrees Centigrade above the preindustrial period was recorded. Stronger efforts are needed to build resilience and mitigate some of the impacts. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms to enhance capacity in the field of effective climate change related planning and management in least developing countries and small island developing states, with particular emphasis on women, youth and local as well as marginalized organizations.

Training Needs

The initiative can be easily managed and only requires training in loan management and accountability. Furthermore, official documentations related to the loan application process will be prepared. The above suggested bodies will be capable of executing the initiative successfully.

Initiative II

Home Garden Initiative

Description

Communities are turning to urban agriculture and gardening as ideal option to increase their access to and availability of healthy, nutritious and affordable food sources. A garden can become a new community asset by improving the aesthetic value of the neighbourhood, which in turn economically improve property values. Community gardens provide numerous benefits to the people through the provision of additional leisure activities, fresh produce and inculcate positive sense of pride for the community, thereby encouraging social interactions and cooperation among inhabitants. Home garden initiatives have been practiced worldwide; the community of Milwaukee in United States of America e.g. has adopted the Victory Garden initiative as a way of bringing the community together to culture their own food through the use of environmentally- friendly and sustainable practices to enhance food security and ecosystem health.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs):

- Rakeen Women Society (جمعية سيدات راكين): Potential implementing partner
- Women Cooperative Society (جمعية المرأة التعاونية): Potential implementing partner.
- Retired Militaries Society (جمعية المتقاعدين العسكريين): Potential implementing partner.
- Al-Karak Municipality: Project facilitation and overall supervision
- MENARET Project Management Unit (PMU): Facilitation and Supervision

Process

The Revolving Fund is a program which provides funding for household and individuals within the municipality boundaries wishing to undertake home garden initiatives. The funding is provided in the form of a low or no-interest rate loan that is to be repaid within an approved number of years or months agreed by the Project Management Unit (PMU) or a nominated partner NGO. Funds may be accessed through a competitive application process. Types of suggested supported activities include:

- **Greywater systems for irrigation**
- **Rainwater harvesting wells.**
- **Drip irrigation system installation**

- Seedlings purchase

Project Reporting

The recipient of the loan must provide within 90 days of a completed project document to the municipality officials that includes but not limited to:

- A brief review of the project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the project

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if implemented:

4. **SDG2** *"End hunger, achieve food security and improved nutrition and promote sustainable agriculture"*: Efforts to combat hunger and malnutrition have advanced significantly since 2000. Ending hunger, food insecurity and malnutrition for all, however, will require continued and focused efforts, especially in Asia and Africa. Furthermore, this initiative will contribute to:
 - **2.1 (2.1.2)**: By 2030, end hunger and ensure food access to all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
 - **2.5 (2.5.1)**: By 2020, maintain the genetic diversity of seeds, cultivated plants, farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
5. **SDG6** *"Ensure availability and sustainable management of water and sanitation for all"*: Access to safe water and sanitation and sound management of freshwater ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
6. **SDG13** *"Take urgent action to combat climate change and its impacts"*: Global warming continued in 2016, setting a new record of about 1.1 degrees Centigrade above the preindustrial period, according to the World Meteorological Organization (WMO) Statement on the state of the global climate in 2016. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.3 (13.3.1 and 13.3.2)**: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small

island developing States, including focusing on women, youth and local and marginalized communities

Training needs

The initiative can easily be managed and project proponents will require training in loan management and accountability. Furthermore, official documentations related to the loan will be developed and prepared. The suggested entities shall be capable of executing the initiative directly.

Initiative III

Rainwater Harvesting techniques at farm level

Description

Traditionally as this area is classified as the dry land region, farmers have developed many sound techniques to find suitable ways to make efficient use of rainwater; these techniques include rainwater harvesting wells, terraces and contour lines. Countries such as India and Seychelles have adopted rainwater harvesting techniques to irrigate the agricultural lands and also assist households especially during the dry seasons.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs):

- Rakeen Women Society (جمعية سيدات راكين): Potential implementing partner
- Women Cooperative Society (جمعية المرأة التعاونية): Potential implementing partner.
- Retired Militaries Society (جمعية المتقاعدين العسكريين): Potential implementing partner.
- Al-shareef Cooperative society (جمعية الشريف التعاونية): Potential implementing partner.
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Facilitation and supervision

Process

A Revolving Fund is a program which provides funding for farmers and individuals within the municipality boundaries who wish to undertake rainwater harvesting techniques as part of their agricultural activities. The funding is provided in the form of a low or no-interest rate loan that is to be repaid within an approved number of years or months set by the Project Management Unit (PMU) or an approved partner NGO. Funds can be accessed through a competitive application process. Types of suggested supported activities include:

- Digging rainwater harvesting well
- Preparing terraces and contour lines for plantations.
- Combining the old harvesting techniques with new technologies like drip irrigation systems and solar pumping for additional energy sources.
- Seedlings purchase

Project Reporting

The recipient of the loan will need to provide within 90 days a completed project proposal to the municipality officials that includes but not limited to:

- A brief review of the project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

1. **SDG6** "Ensure availability and sustainable management of water and sanitation for all": Access to safe water and sanitation as well as sound management of freshwater ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
2. **SDG13** "*Take urgent action to combat climate change and its impacts*": Global warming still exist, And its impact can be felt; a new temperature record of about 1.1 degrees Centigrade above the preindustrial period, was noted in 2016 by the World Meteorological Organization's (WMO) statement on the state of the global climate. Stronger efforts are needed to build resilience and mitigate the impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular focus on women, youth, local and marginalized communities

Training needs

The initiative can be easily managed and only requires the proponents to undertake training in loan management and accountability. Furthermore, official documentations related to the loan will prepared and disseminated prior to official loan signing. The aforementioned suggested entities will be capable of successfully executing the initiative.

Initiative IV

Biogas Production on the household level

Description

Biogas is the gaseous fuel produced as a result of the biodegradation of organic matter, in other words fermentation. In most cases, methane is the main product in this type of fuel. Biogas is an energy source that has been used for many centuries. Using the waste products as raw materials is probably one of the most pleasant ways of producing biogas to be used in heating and generating electricity. Additionally, by upgrading the gas produced during development of biogas can provide fuel sources to run vehicles. Capturing the methane released from the landfills and breaking them down into carbon dioxides using biogas uses will certainly help reduce our greenhouse gas (GHG) emissions. Methane is 25 times more potent than carbon dioxide in terms of greenhouse effect. Countries such as Germany, India, China and Australia have developed biogas production to reduce reliance and pressures on use of fossil fuel.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs):

- Rakeen Women Society (جمعية سيدات راكين): Potential implementing partner
- Women Cooperative Society (جمعية المرأة التعاونية): Potential implementing partner.
- Retired Militaries Society (جمعية المتقاعدين العسكريين): Potential implementing partner.
- Al-Shareef Cooperative society (جمعية الشريف التعاونية): Potential implementing partner.
- Al-karak Livestock husbandry (الكرك لتربية المواشي): Potential implementing partner.
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Facilitation and supervision

Process

Two key processes namely mesophilic and thermophilic digestion that are highly dependent on temperature. Landfill gas is produced by the decomposition of wet organic waste under anaerobic conditions, to produce biogas. The waste is covered and mechanically compressed by the weight of the material that is deposited on top as waste is dumped at landfills. This material prevents oxygen exposure thus allowing anaerobic microbes to thrive. Biogas builds up and is slowly released into the atmosphere if the site has not been engineered to capture the gas. Landfill gas released in an uncontrolled way can be hazardous since it can become explosive when it escapes from the landfill and mixes with oxygen. The lower explosive limit is 5% methane and the upper limit is 15% methane.

Therefore, it is advisable to perform this initiative at municipality level or with a knowledgeable partner following proper training.

Project Reporting

The recipient will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant detail pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

1. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming is ongoing and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate the impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms to increase local capacity in effective climate change-related planning and management in least developed countries and small island developing states, with particular focus on women, youth and local and marginalized communities

Training needs

The initiative is quite advanced and require some safety measures before implementation on the household level. Training in the installation of the system, safety precautions, loan management and accountability are required. Furthermore, official documentations related to the loan application will be developed prior to approval and signing. The above suggested entities will be capable of implement the initiative successfully.

Initiative V

Drip Irrigation Systems Revolving Fund (SRF)

Description

The Revolving Fund is a program which provides seed funding for household and individuals within the municipality boundaries who wish to undertake solar energy/green initiatives. The funding is provided in the form of a no-interest loan that is to be repaid within an approved number of years by the Project Management Unit (PMU). Funds may be accessed through a competitive application process which must be supported by a strong business case. The revolving fund is designed to:

- Motivate individuals on the household level to engage in actions to minimize the environmental impacts
- Remove any excuse or weakness (e.g. lack of funding) for beneficial projects with longer term paybacks
- Facilitate the peer-to-peer education opportunities that complement many of the innovative projects financed through the fund

Drip irrigation is a form of irrigation that saves water and fertilizer by allowing water to drip slowly to the roots of many different plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing and emitters. It is done through narrow tubes that deliver water directly to the base of the plant.

It is the preferred choice over surface irrigation as it minimizes rate of evaporation, thereby making economic savings and minimise wastage of water. Countries such as Nicaragua, India and Yemen have adopted drip irrigation methods as a means to save water and minimise financial losses in agricultural practices.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Rakeen Women Society: Potential implementing partner
- Women Cooperative Society: Potential implementing partner.
- Retired Militaries Society: Potential implementing partner.
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Facilitation and supervision

Process

Project funding is delivered through a competitive application process. The maximum and minimum loan range will be announced, once applications have been accepted. A loan agreement will be signed, where individuals obtain loans to purchase drip irrigation technology products to install the technology at the area of choice within the municipality boundaries. Application forms can be obtained from the PMU and\ or the municipality. This should be followed by submitting the completed application form together with a certified copy of the beneficiary ID and latest pay slip or proof of income. Successful applications will be notified in writing as well as telephonically to pay the required deposit and send the proof of payment to the responsible authority.

Project Reporting

The recipient will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if usefully implemented:

8. **SDG6** "Ensure availability and sustainable management of water and sanitation for all": Access to safe water, sanitation and sound management of freshwater ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1):** By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

- **6.B (6.B.1):** Support and strengthen the participation of local communities in improving water and sanitation management
9. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming still exists and according to the 2016 World Meteorological Organization’s (WMO) statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was recorded. Stronger efforts are needed to build resilience and mitigate the impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, including focusing on women, youth, local and marginalized communities

Training needs

The initiative can be easily managed and proponent will require loan management and accountability training. Furthermore, official documentations relating to the loan will be prepared prior to approval and signature. The above suggested entities will be capable of executing the initiative directly.

Initiative VI

Solar (Photovoltaic) Pumps in farms

Description

The solar pumps are powered by solar energy trapped on the surface of semiconductor materials (PV cell) through electromagnetism. Around 36 cells are used and connected in series nominal 12-volt charging system. The PV module constitutes the basic building block from which any size PV array can be configured to suit the application. The PV array converts the solar radiation into DC power and this power is then used directly or indirectly (converted into AC using an inverter) to power the electrical motors to operate pumps or any agricultural machinery.

Solar pumps generally incur a high initial capital investment cost; however, this cost can be offset on the long term through the longevity of its service life and minimal operation and maintenance costs throughout usage period. Solar pumps are very reliable technology and can be matched quite closely to the amount of water needed. However, since solar pumps cannot deliver water on demand, a thorough assessment of the solar energy resource and water demand is required. Water tanks should be adequately designed to store enough water for days when there is little or no solar radiation. Current success of using this system can be seen in Nicaragua and lessons can be learnt and transferred in the MENA Region.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Rakeen Women Society: Potential implementing partner
- Women Cooperative Society: Potential implementing partner.
- Retired Militaries Society: Potential implementing partner.
- Al-shareef Cooperative society Potential implementing partner.
- Farmers
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Facilitation and supervision

Process

Project funding will be delivered through a competitive application process. Based on the administration type, the solar pumps will be installed to support farmers in reducing the cost of energy supply, and meet their water demands for their agricultural activities. Application forms can be obtained from the appointee administration body, completed and submitted with the relevant paperwork including identification of proponent(s).

Project Reporting

The recipient will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

10. **SDG6** "Ensure availability and sustainable management of water and sanitation for all": Access to safe water, sanitation and sound management of freshwater ecosystems are essential to human health and to environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
11. **SDG7** "Ensure access to affordable, reliable, sustainable and modern energy for all": Meaningful improvements of energy will require increased capital investments and strong policy commitments, together with the willingness of countries to embrace new technologies on a larger scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services

- **7.2 (7.2.1):** By 2030, increase substantially the share of renewable energy in the global energy mix
12. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming still exists and according to the 2016 World Meteorological Organization’s (WMO) statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are needed to build resilience and mitigate the impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular focus on women, youth and local and marginalized communities

Training needs

The initiative can be easily managed and only requires recipients to undertake training in loan management and accountability. Furthermore, official documentations related to the loan application and conditions will be developed prior to approval and signature. The above mentioned suggested entities shall be capable of executing the initiative directly.

Initiative VII:

Solar (Photovoltaic) Panels in Ecotourism

Description

Tourism is an important sector in Karak, the initiative will encourage tourism operators and other organizations working within the tourism sector to opt for renewable energy in their operations. The PV module constitutes the basic building block from which any size PV array can be configured to suit the application. The PV array converts the solar energy into DC power, which is then used directly or indirectly (converted into AC using an inverter) to power the electrical devices and appliances in establishments. South Korea, Spain and Australia are some of the countries where such practice has been successfully adopted and is still being implemented.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Momya Waterfalls society: Potential implementing partner
- Al-Karak Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Facilitation and s supervision

Process

Project funding will be delivered through grant application and disbursement to the implementing partner. The solar system will be installed to support the tourism establishment of infrastructure to meet the energy requirements as well as reduce the cost of purchasing energy sources for operation.

Project Reporting

The recipient will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the document that requires attention.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

13. **SDG6** "Ensure availability and sustainable management of water and sanitation for all": Access to safe water, sanitation and sound management of freshwater ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, with particular emphasis on women and girls' needs and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
14. **SDG7** "Ensure access to affordable, reliable, sustainable and modern energy for all": Improvements in energy sources require increased financial resources and strong policy commitments, together with the countries' willingness to accept and embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
15. **SDG13** "Take urgent action to combat climate change and its impacts": Global warming still exists and according to the World Meteorological Organization's (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are needed to build resilience and mitigate the impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular focus on women, youth, local and marginalized communities

Training needs

The initiative can be easily managed and project proponents will need to undertake training in grants management and accountability. In addition to project management and reporting, special training in the maintenance of the solar powered systems will also be necessary.

Small initiatives in Lebanon

Based on the focus groups that were established in Lebanon, a set of small initiatives were proposed, which could be applied either at municipality, household or individuals' levels. The following briefly describe these initiatives.

Initiative I

Solar Revolving Fund (SRF)

Description

The Revolving Fund is a program which provides seed funding for household and individuals within the municipality boundaries who wish to undertake solar energy/green initiatives. The funding is provided in the form of a no-interest loan that is to be repaid within an approved number of years as agreed by the Project Management Unit (PMU). Funds may be accessed through a competitive application process which must be supported by a strong business case. The revolving fund is designed to:

- Motivate individuals on the household level to engage in environmentally-friendly actions to minimize detrimental environmental impacts
- Remove any potential setbacks (e.g. lack of funding) for beneficial projects with longer term paybacks
- Facilitate the peer-to-peer education opportunities that complement many of the innovative projects financed through the fund

Type of solar initiatives applicable

- **Solar Home System (SHS):** has the capacity to power lights and devices such as radios, TVs, fridges and cell phone chargers.
- **Solar Water Heater (SWH):** uses solar energy to heat water for domestic use.
- **Photovoltaic Pumping (PVP):** uses solar photo-voltaic panels to provide energy for pumping water for livestock and domestic use
- **Energy Efficient Stoves:** is used for cooking and baking and is considered as an important alternative of wood; thus, saving money and reducing detrimental environmental impacts.

Administration

- MENARET Project Management Unit (PMU)
- Municipality officials

Process

Project funding will be delivered through a competitive application process. The maximum and minimum loan range will be announced, upon acceptance and approval of applications. A loan agreement will be signed, where project proponents will obtain loans to purchase renewable energy technology products for installations at chosen sites within the municipality boundaries. Application forms (Annex I) can be obtained from the PMU and\ or the municipality, to be completed and submitted along with proof of identification and recent financial information (payslip or proof of income). Successful applications will be notified in writing as well as telephonically and will be required to pay deposit and submitting proof of payment to the responsible authority.

Project Reporting

The recipient of the loans will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.

Other pertinent details that are relevant to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

16. **SDG7** *"Ensure access to affordable, reliable, sustainable and modern energy for all"*

Improvement in energy sources require large financial investment and strong policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:

- **7.1 (7.1.1 and 7.1.2):** By 2030, ensure universal access to affordable, reliable and modern energy services
- **7.2 (7.2.1):** By 2030, increase substantially the share of renewable energy in the global energy mix

17. **SDG13** *"Take urgent action to combat climate change and its impacts"*: Global warming still exists and according to the World Meteorological Organization's (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are needed to build resilience and mitigate the impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:

- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular focus on women, youth and local and marginalized communities

Initiative II

Solar Farm (SF)

Description

Solar farm is a large-scale photovoltaic system (PV system) designed to supply merchant power into the electricity grid to power thousands of homes, businesses infrastructures. The solar power source is acquired via photovoltaic modules that convert light directly to electricity. The photovoltaic (PV) cells made of silicon are constructed into panels, each gathering a small amount of sunlight energy. The panels are installed on short towers over an area as big as 0.5Km². Multiple panels are required to generate significant amount of electricity, which is why solar panel farm arrays are so large.

Administration

It is advisable that the municipality leads this initiative, since the solar farm business owners either buy the land for their panels, or lease it from businesses, government agencies or private individuals.

Process

The land area required for the desired power output, varies depending on the location and the efficiency of the solar modules, the slope of the site and the type of mounting used. The best locations for solar parks in terms of land use are brown field sites, or where there are no other economic activities. Even in cultivated areas, a significant proportion of the site of a solar farm can also be devoted to other productive uses, such as crop growing or biodiversity.

Project Reporting

The municipality as the proponent of the initiative will need to provide within 90 days a complete project report to the project management team and relevant authorities that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

18. **SDG7** "*Ensure access to affordable, reliable, sustainable and modern energy for all*": Improvements in energy technology will require high capital investments and strong policy commitments, along with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2):** By 2030, ensure universal access to affordable, reliable and modern energy services

- **7.2 (7.2.1):** By 2030, increase substantially the share of renewable energy in the global energy mix
 - **7.3 (7.3.1):** By 2030, double the global rate of improvement in energy efficiency
19. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming exists and according to the 2016 World Meteorological Organization’s (WMO) 2016 Statement on the State of the Global Climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was recorded. The World Increased efforts are required to build resilience and mitigate impacts related to climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular focus on women, youth, local and marginalized communities

Initiative III

Grey Water Recycling and Reuse (GWRR)

Description

Greywater is the wastewater discharged from a house, excluding sewage (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs and washing machines. It commonly contains soap, shampoo, toothpaste, food scraps, cooking oils, detergents and hair. Greywater makes up the largest proportion of the total wastewater flow from households in terms of volume. Typically, 50-80% of the household wastewater is greywater. If a composting toilet is also used, then 100% of the household wastewater is greywater.

Not all greywater is equally "grey". Kitchen sink water laden with food solids and laundry water that has been used to wash nappies are more heavily contaminated than greywater from showers and bathroom sinks. Therefore, different greywater flows may require different treatment methods that would render the water suitable for reuse.

Administration

- Municipality officials

Process

Greywater from baths, showers, washbasins and washing machines has to be collected separately from black-water, treated and eventually disinfected for reuse as a non-potable water source. The various systems of greywater reuse fall into two categories namely diversion systems and treatment systems, highlighted from existing practices around the world.

1. Diversion systems: direct greywater from the laundry or bathroom to the garden for immediate use in restricted irrigation, without making changes to its quality. The water is not stored for more than a few hours, if at all.
2. Treatment systems: improve the quality of the greywater by filtering, treating and disinfecting it. Treated greywater can be stored for longer periods without the risk of it going septic and causing odour nuisances. Its higher quality and ability to be stored means that it can be used for more purposes, including garden watering and irrigation, toilet flushing and laundry washing.

Project Reporting

This initiative could be applied at the level of municipality, institutions and household levels. Therefore, the recipient of the loan will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertinent to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

20. **SDG6** *“Ensure availability and sustainable management of water and sanitation for all”*: Access to safe water, sanitation and sound management of freshwater ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
21. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming still exists and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.3 (13.3.1 and 13.3.2)**: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, including focusing on women, youth and local and marginalized communities.

Initiative VI

Solar Energy for Irrigation (SEI)

Description

Solar pumping can help offset the cost of traditional irrigation fuels. The more often a pump is run, the greater the opportunity for savings from solar energy use. Solar pumps are reliant exclusively on the sun to provide power and therefore operate only during daylight hours unless coupled with a battery/storage system. Solar pumps may be a good option for lower water volume and daytime irrigation systems. As yet, affordable solar technology is unable to supply sufficient power to pump enough water for large-scale flood irrigation.

Administration

- Individuals who own farms

Process

A typical solar-powered pumping system consists of solar panels connected to an electric motor that runs a bore or surface electric pump. A solar pumping solution available from the irrigation supplier will typically supply a DC (mains powered) pump that is connected directly to the solar panel and does not require a DC/AC inverter. DC brushless motors also offer very high efficiency levels (over 90 percent). In cases where an AC (battery-powered) pump is already in place, an inverter is required between the PV panel and the motor to convert from the direct current generated by the solar panel to the alternate current required by the electric pump motor.

In the case of a solar-diesel hybrid system, a solar pumping system (PV panel plus pump) is installed to complement the existing diesel pump operation. The solar pump can either pump directly into the system to offset diesel pump operation during daytime, or pump water to a storage tank or reservoir (which is part of the solar pumping solution) so that water is also available on cloudy days and at night.

Project Reporting

The recipient of the loan will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented.

22. **SDG7** “Ensure access to affordable, reliable, sustainable and modern energy for all”: Improvements in energy sources and technology require high capital investments and strong policy commitments, coupled with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:

- **7.1 (7.1.1 and 7.1.2):** By 2030, ensure universal access to affordable, reliable and modern energy services
- **7.2 (7.2.1):** By 2030, increase substantially the share of renewable energy in the global energy mix

23. **SDG13** “Take urgent action to combat climate change and its impacts”:

Global warming still exists and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:

13.B (13.B.1): Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, including focusing on women, youth, local and marginalized communities

Small initiatives in Tunisia

Based on the study findings conducted in Tunisia, a set of small initiatives were proposed, which could be applied at household or individuals’ levels. The following illustrates brief description of these initiatives.

Initiative I

Revival of Rain water harvesting activities at households

Description

The applications of the rainwater harvesting techniques such as the use of rainwater harvesting wells on the household level is classified as an important activity to secure water and ensure a more efficient utilization of rain water. It was clear through the study findings that local communities at Monastir municipality had made use of rain water harvesting techniques on the household level. This was obvious by the number of old city houses having rain water collecting wells. As a result of many social and economic reasons, this practise has changed and people are no more adopting rainwater harvesting techniques at home.

The initiative will work on revival of those techniques and will encourage locals to practice those techniques through provision of low or no interest loans with minimum administrative fees.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Notre Grand Bleu : Potential implementing partner.
- Environment Ambassadors: Potential implementing partner
- Rospina Society for Environment and Sustainable Development: Potential implementing partner.
- Monastire Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Project facilitation and supervision

Process

The following methods will be adopted to ensure the adoption of rainwater harvesting techniques on the household level

- **Create or identify a surface suitable for rainwater collection.** The easiest way to collect rainwater is to channel the water that runs off a broad surface better known as the "catchment area."
- **Set up a collection point for water on the catchment.**
- **Connect the collection point to a conveyance system.** Quite simply, the "conveyance system" is just some form of tube or channel that transports the water to a storage unit.
- **Install a storage system that can work close to your home.** The biggest barrier to rainwater collection is the matter of storage. It is only useful to collect rainwater if it can be done in large quantities, but it is not always easy to determine the best means of doing so.
- **Connect the storage unit to the conveyance system.** Extend the pipes or channels to the barrels, cisterns, or reservoir that will be used.
- **Develop a system for water retrieval.** You must be able to draw water from the storage units when needed.
- **Add filtration mechanisms (optional).** Though the water that you collect from a rooftop or hillside should not be drunk, it may still be a good idea to install filters of some sort. The pipe and storage tanks could fill or become clogged with dirt.

Project Reporting

The recipient will need to provide within 90 days a completed project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertinent to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

3. **SDG6** "Ensure availability and sustainable management of water and sanitation for all": Access to safe water, sanitation and sound management of freshwater

ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:

- **6.2 (6.2.1):** By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
- **6.B (6.B.1):** Support and strengthen the participation of local communities in improving water and sanitation management

24. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming still exists and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:

- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular emphasis on women, youth and local and marginalized communities

Training needs

The initiative can be easily managed and project proponents will need to undertake training only requires in management of loans and accountability. The aforementioned suggested entities will be capable of executing the initiative directly.

Initiative I

Solar Energy for Household Use

Description

Two types that can be used:

1. Photovoltaic (PV) systems convert sunlight directly to electricity. They work during daytime when the sun is shining, but more electricity is produced when the sunlight is more intense and strikes the PV modules directly (as when rays of sunlight are perpendicular to the PV modules). Unlike solar thermal systems for heating water, PV does not use the sun's heat to make electricity. Instead, electrons freed by the interaction of sunlight with semiconductor materials in PV cells are captured in an electric current. PV allows you to produce electricity— without noise or air pollution— from a clean, renewable resource.
2. Solar thermal technology uses the sun’s energy, rather than fossil fuels, to generate low-cost, environmentally friendly thermal energy. This energy is used to heat water or other fluids and can also power solar cooling systems. Solar thermal systems differ from solar photovoltaic (PV) systems, which generate electricity rather than heat.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Notre Grand Bleu: Potential implementing partner.
- Environment Ambassadors: Potential implementing partner
- Rospina Society for Environment and Sustainable Development : Potential implementing partner.
- Monastire Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Project facilitation and supervision

Process

This activity could be performed easily on the household level as it will be managed through revolving funds with low interest or minimum administrative fees, but the following questions must be duly addressed prior to project initiation:

- Who sells and installs PV systems and solar thermal systems?
- Which PV and Solar thermal providers should be chosen?
- Has the company previously installed grid connected PV systems? If not, has it installed grid-independent (or stand-alone) PV systems?
- Is the lowest price the “best deal”?

Project Reporting

The beneficiary will need to provide within 90 days a complete project report to the implementing partner that includes but not limited to:

- A brief review of project’s success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

25. **SDG7** *“Ensure access to affordable, reliable, sustainable and modern energy for all”*: Meaningful improvements of energy will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
26. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming still exists and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:

- **13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular emphasis on women, youth, local and marginalized communities

Training Needs

The initiative can be easily managed and project proponents will undertake training in loan management and accountability. Furthermore, official documentations related to the loan application process will be prepared prior to approval and official project signing. The aforementioned suggested entities will be capable of successfully implementing the initiative.

Initiative III:

Solar (Photovoltaic) Panels in Ecotourism

Description

Tourism is an important sector in Monastir as it is considered is a major tourist resort with many tourism activities including ecotourism activities. The idea is to encourage tourism operators and establishments to use renewable energy in their operations. The PV module constitutes the basic building block from which any size PV array can be configured to suit the application. The PV array converts the solar radiation into DC power, which is then used directly or indirectly (converted into AC using an inverter) to power the electrical devices such as lamp and any other devices.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Notre Grand Bleu: Potential implementing partner.
- Monastir Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Project facilitation and supervision

Process

Project funding will be delivered through a grant to the implementing partner. The solar system will be installed to support the camp or lodge as the key means to reduce the cost of energy supply and operations and to attain the required amount of energy for operation.

Project Reporting

The recipient will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.

- Other relevant details pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if applied on- ground

27. **SDG6** “Ensure availability and sustainable management of water and sanitation for all”: Access to safe water, sanitation and sound management of freshwater ecosystems are essential to human health, environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1)**: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
 - **6.B (6.B.1)**: Support and strengthen the participation of local communities in improving water and sanitation management
28. **SDG7** “Ensure access to affordable, reliable, sustainable and modern energy for all”: Improvements of energy sources require higher capital investments and strong policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
 - **7.1 (7.1.1 and 7.1.2)**: By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1)**: By 2030, increase substantially the share of renewable energy in the global energy mix
29. **SDG13** “Take urgent action to combat climate change and its impacts”: Global warming still exists and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
 - **13.B (13.B.1)**: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular emphasis on women, youth, local and marginalized communities

Training needs

The initiative can be easily managed and project proponents will undertake training in grants management and accountability. In addition to project management and reporting, special training in the maintenance of the solar energy systems must be undertaken.

Initiative IV:

Water and energy saving devices shop

Description

Water and energy are vital to all communities and are intricately linked in terms of generation and supply. We can seek and develop new resources to increase supplies, but the simplest and cheapest way to secure a sustainable future is by decreasing demand through efficiency and conservation. As we use less water, we use less energy and vice versa. Some strategies are simple: using more efficient light bulbs, programmable thermostats and low-flow plumbing fixtures. We can also introduce smart energy systems that allow for more effective monitoring and control of an entire office building. We can even pursue alternative and renewable sources, such as solar energy. What is most important is that, as a growing community, we simply use less. This nearly always leads to more money in our pockets.

Administration

This initiative could be mastered by one of the following entities or a combination of more than one institution (through MOUs)

- Notre Grand Bleu: Potential implementing partner.
- Environment Ambassadors: Potential implementing partner
- Rospina Society for Environment and Sustainable Development: Potential implementing partner.
- Monastire Municipality: Project facilitation and supervision
- MENARET Project Management Unit (PMU): Project facilitation and supervision

Process

The municipality will need to provide collaterals either in terms of operating space of land or land to the local NGOs running this program. The operating space will be equipped and it is highly recommended to adopt the revolving fund as a key marketing tool.

Project Reporting

The recipient will need to provide within 90 days a complete project report to the municipality officials that includes but not limited to:

- A brief review of project's success stories or challenges.
- Updated estimates of current and future savings and expenditure.
- Other relevant details pertaining to the project.

Contribution to the Sustainable Development Goals (SDGs)

This initiative can contribute to the following SDGs if successfully implemented:

30. **SDG6** "Ensure availability and sustainable management of water and sanitation for all": Access to safe water, sanitation and sound management of freshwater ecosystems are essential to human health and to environmental sustainability and economic prosperity. Furthermore, this initiative will contribute to:
 - **6.2 (6.2.1):** By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, with particular emphasis on women and girls and those in vulnerable situations

- **6.B (6.B.1):** Support and strengthen the participation of local communities in improving water and sanitation management
31. **SDG7** *“Ensure access to affordable, reliable, sustainable and modern energy for all”*: Improvements in energy sources and technology require high capital investments and strong policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. Furthermore, this initiative will contribute to:
- **7.1 (7.1.1 and 7.1.2):** By 2030, ensure universal access to affordable, reliable and modern energy services
 - **7.2 (7.2.1):** By 2030, increase substantially the share of renewable energy in the global energy mix
32. **SDG13** *“Take urgent action to combat climate change and its impacts”*: Global warming still exists and according to the World Meteorological Organization’s (WMO) 2016 statement on the state of the global climate, a new temperature record of about 1.1 degrees Centigrade above the preindustrial period was observed. Increased efforts are required to build resilience and mitigate impacts of climate-related hazards and natural disasters. Furthermore, this initiative will contribute to:
- 13.B (13.B.1):** Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, with particular emphasis on women, youth and local and marginalized communities

Training needs

The initiative can be easily managed and project proponents will undertake training in business management and accountability in revolving funds management. In addition to project management and reporting, proponents will undertake special training in maintenance of the solar energy systems.