

## **Building Mutah University Energy Management Vision based on the Energy Solutions Factory Framework**

In this decade, the world is hardly pushed towards adopting more *stringent and innovative practices* to conserve and manage existing university energy resources. In response to these *global and local Energy Crisis conditions*, Mutah University's *Energy Management Vision* increasingly occupies a significant portion of the university management and technical staff concern. Multiple university units and centers collaborate to put this vision into practice, such as **Figure 1**:

1. Training, Consultation, and Communication Center
2. Maintenance and Sustainable Unit
3. Prince Faisal Center for Dead Sea, Environmental and Energy Research
4. Entrepreneurship Center
5. Community and Development Center

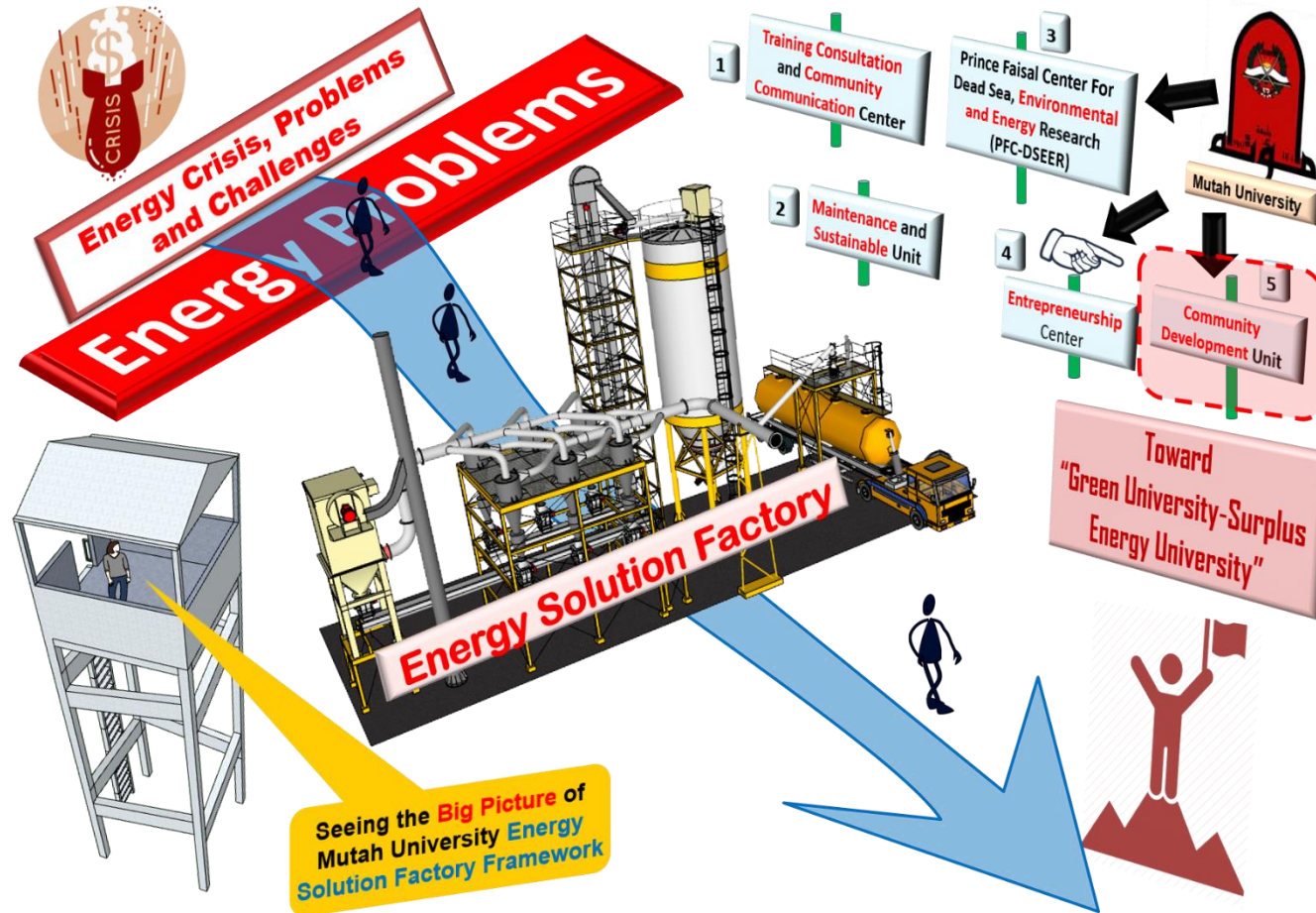


Figure 1: A Visual big picture of Mutah University Energy Management vision based on Energy Solution Factory framework

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Energy management activities are paralyzed by *fragmentation and the absence of an integrated vision* to accommodate multiple activities of multiple units and centers at Mutah University. *Energy Solution Factory Framework* is the most important framework that can unify energy management efforts under one umbrella, which can be moved easily to serve many contexts, as illustrated in **Figure 1**. Academic institutions are globally considered policies, technologies, and know-how generation environments that can be incubated to fruit developments in all fields. The philosophy looks to university centers and units as factories that can convert challenges into opportunities to transfer know-how and technologies and produce solutions. Mutah University's energy management vision is mainly based on this crucial Factory Solution Perspective, as illustrated in **Figure 1**.

### **Integrated Picture of Mutah University Energy Management Activities**

Energy Management Practices integration is one of the most important added values to the developed *Energy Management Vision*. This vision is based on gathering the Energy Management Practices offered by the five main university centers and units listed above as one continuum that aims to achieve the big goal of these efforts of converting Mutah University into a green Energy Surplus University, as illustrated in **Figure 2**. The importance of combating the negatives of fragmentation of these diverse efforts is reflected in constructing an integrated picture of the whole university's energy management activities, as illustrated in Figure 2. Seeing the big picture of these collaborative practices is paramount to Energy Management Integration.

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## Constructing Far Reaching Road Map of Mutah University Energy Management Activities based on Seed to Fruit Framework

**Solution Factory Framework** adopted before helped create a generic template that helped put all energy management efforts in a generic solution production form that can be easily moved to be implemented in all contexts, as illustrated in **Figure 1**. The construction of an integrated picture was a second critical step in shifting our thinking in Energy Management from the fragmented mode to the integrated and continuum mode, as illustrated in **Figure 2**. It is time now to go deep into *micro integration* by deeply looking at energy management activities from a seed growth perspective that classifies these activities as one of four types, see **Figure 3**:

1. Seed Activities
2. Root Activities
3. Branches Activities
4. Fruit Activities

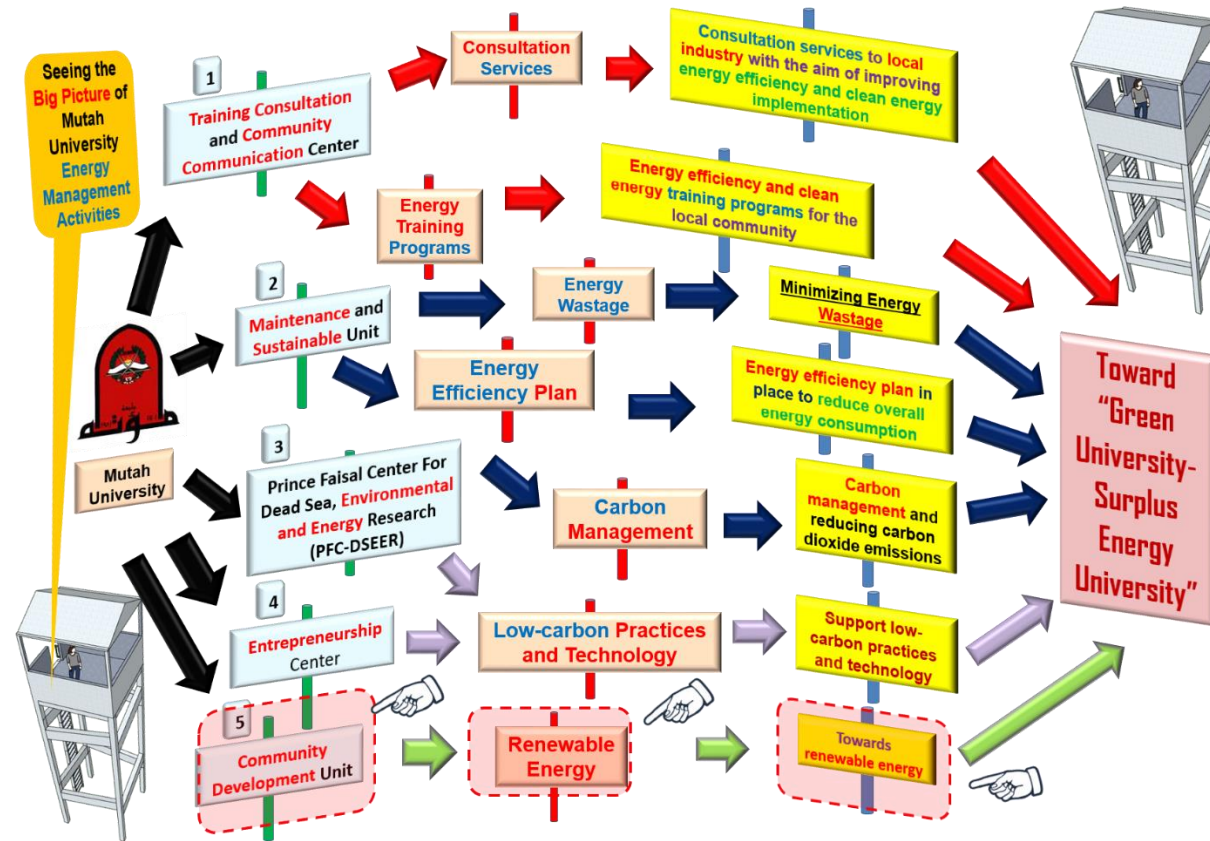


Figure 2: A Visual Big Picture of Mutah University Energy Management Activities



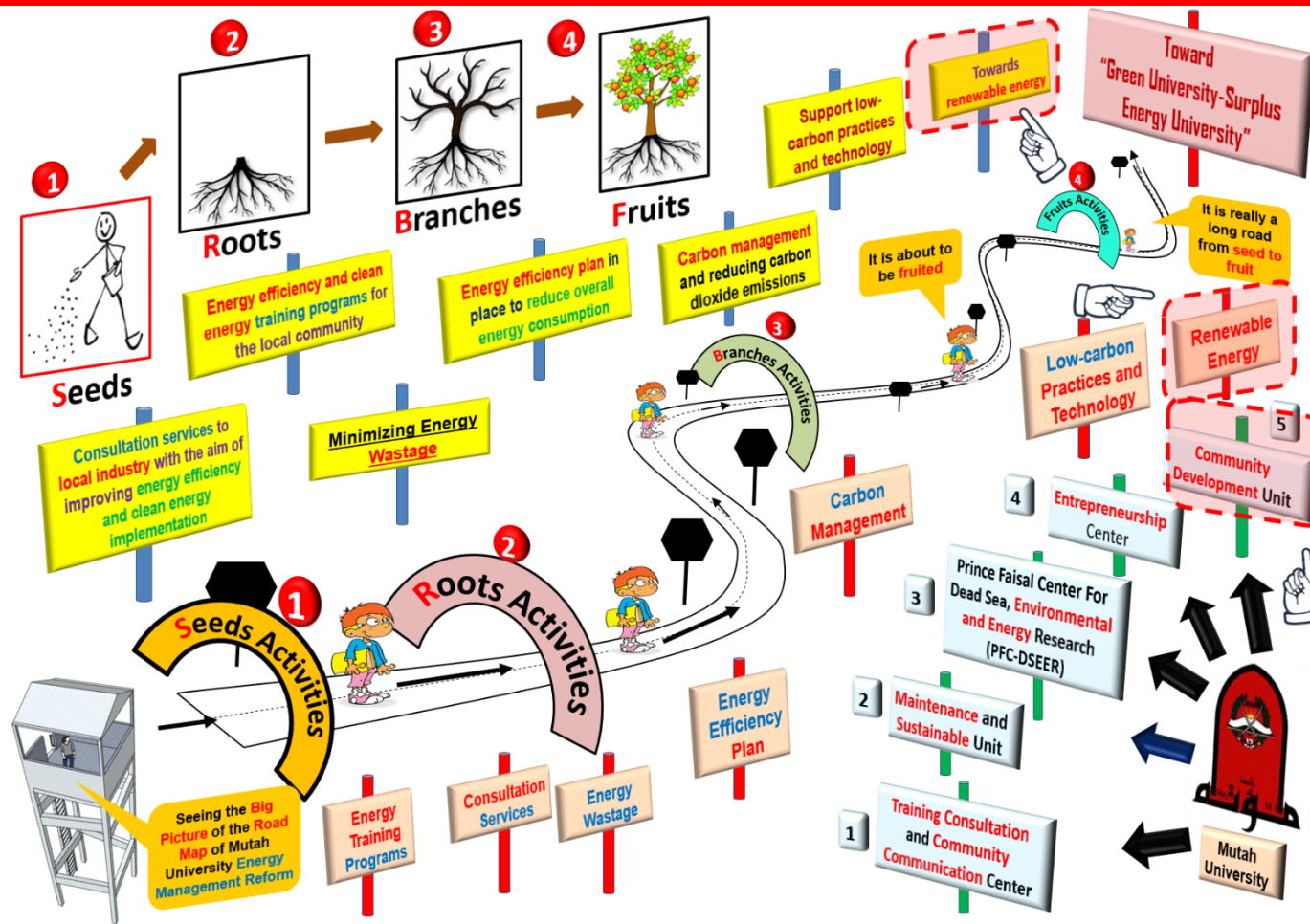


Figure 3: A Visual road map of Mutah University Energy Management Activities based on seed to fruit framework

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This seed-to-fruit framework will add an instrumental relationship to the network of these activity fragments and help shift Energy Management Thinking to the instrumental mode that gives meaning to these series and parallel network of practices (**Figure 3**).

### Community Development Unit

The service of the local community through what the university offers as a scientific and civilized institution is the solid scientific basis for societal unity. It is the actual choice of solidarity, parity, and integration, according to which a regular increase in individual and collective productivity is achieved within a framework of relations that deepen participation and provide guarantees of personal and societal security that take into account the present data and the needs of The future and its prospects, and based on this concept, the Community Development Unit at Mutah University, which was established in 2002, worked to bring about the positive changes required in the life of the individual and society.

Its development programs and plans are as follows:

- ✓ Holding development programs such as lectures, workshops, seminars, and conferences to support the local community's axes of cultural, social, and economic development to determine its needs and develop an appropriate mechanism to serve it.
- ✓ Coordination between the university and the local community to determine its needs and develop an appropriate mechanism to serve it, especially by switching to renewable energy and supporting its substitution for traditional energy.
- ✓ Preserving the vocabulary of the Jordanian heritage, especially in the southern region, and working on everything that contributes to deepening the authenticity of this heritage.

The Community Development Unit held several meetings with representatives of the local community and its leaders to spread awareness about the importance of preserving the environment, the dangers of climate change, and the need for a complete transition to renewable energy sources to meet the various energy needs. The meetings include the following:

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- ✓ A meeting with agricultural sector representatives and spreading awareness of using photovoltaic systems for water pumping and irrigation instead of using traditional sources.
  - ✓ Meetings with the local community to raise awareness about using alternative energy sources and the need to rationalize energy consumption and preserve the environment.
  - ✓ Meeting with shop owners and spreading awareness of replacing traditional energy sources with renewable energy



- ✓ A meeting with local community school students and raising awareness about the importance of energy and the need to conserve it, support the use of renewable energy sources, and keep creative ideas.
- ✓ A meeting with the local government to support the idea of switching to renewable energy, providing studies and consultations in this regard, and putting forward ideas such as lighting roads with solar energy, green gardens, and others.

The Community Development Unit has adopted some creative ideas to switch to solar energy, such as:

Project Name	Definition
The Solar Umbrella Project It started in 2020 and is still expanding in 2022	It is a project that deploys waiting for seats equipped with chargers that operate on solar energy.
Solar heaters project It started in dormitories in 2020 and is still expanding in 2022	a project through which the university divided the local community into sectors and distributed free solar heaters to spread awareness and promote the idea.
Solar Lighting Project	It is a project that aims to convert the lighting of all roads in the local community area and off-grid communities to operate with solar energy. The university distributed, installed, and maintained the distributed units, and 60% of the project was implemented until 2020 and is expected to be completed by 2025.

The plan has addressed the following themes and actions:

- Green building initiatives: refurbishment of municipal buildings to achieve energy efficiency.
- Energy-efficient Street Lighting: 7000 units will be replaced with LED units by July 2022.
- Install a 3MWp PV station to generate renewable energy estimated to cover around 55% of the municipality's electricity consumption. Besides the contribution of the Ministry of Local Administration, the project will be implemented via a Public Private Partnership, in which the partner from the private sector will engage in a Design Build, Operate, and Transfer (DBOT). The project has a lifespan of 30 years and will lead to annual savings of 740,000 Euro, which amounts to more than 22 million Euros over 30 years. The main stakeholders involved in this project are Karak Municipality, the Electricity Distribution Company-EDCO, **Mutah University**, Sam Green Power & Hiba Company, and National Electric Power Company-NEPCO.
- They are replacing diesel cars and machinery in the municipality with hybrid/electric cars: Installing three electric vehicle charging stations located in vibrant urban areas in Karak city. This service is free to encourage people to use electric/hybrid cars.
- It established a training center in collaboration with **Mutah University** that acts as a knowledge hub and aims at training technicians from the local community, including university students, and documenting the work and studies on renewable energy and energy efficiency.

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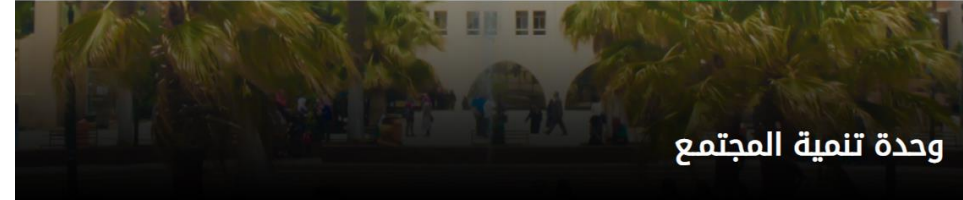
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Conservation Program Jordan is facing a future of very limited water resources, among the lowest in the world on a per capita basis. Demand for energy in the country is growing at a substantial pace. High economic growth in recent years and an expanding population have increased the need for energy resources. Universities are considered large energy consumers in Jordan. Mutah University energy vision aims at utilizing renewable energy and implementing energy efficiency measures to achieve net zero energy consumption and minimum carbon emissions at its campus. In stages the mission of this strategy is to provide suitable energy management, apply conservation of energy, opportunities, and utilize available renewable energy resources with high efficiency and quality of electrical energy. Several steps have been taken towards this goal. 1. Renewable Electrical Energy Production-Pilot project installing a photovoltaic PV system to generate electricity as part of green environment action. 2. MU installed a 2.1 MWp photovoltaic (PVs) as a pilot project (as a seed for the large scale PVs) at PFC-DESER with the Green universities projects. The system produces around 3.348000 MWh annual. 3. Renewable Electrical Energy Production- Large Scale PVs farms 2. MU is working on large scale PVs system. The aim of the project is to obtain net zero energy consumption from utility. MU has less than one month MU is going to announce the Tender document for 5 MWp Project. 4. The figure below shows the proposal location for PVs farm within MU campus. 5. Power Quality Assessment and Mitigation Project - 5PF. This project is funded by Scientific Research Support Fund (SRF) with 40,000 JD. The aim idea of project is to investigate, quantify and address the power and energy quality profiles within Mutah University campus such as: harmonic distortion, power interruptions, voltage sags and surges and other power quality problems. The study will be extended to investigate and characterize the impact of loads characteristics, loads signatures and equipment operation of Medium Voltage (MV), at distribution networks in Electrical Distribution Company (EDCO), on the power quality profiles. Further, as the new regulations has revealed allowing the customers to install as large as their capacities from photovoltaic (PVs), the project will include extensive measurements and detailed assessment of the impact of small-scale (PVs) arrays on the power quality profiles. 6. Campus Load Management and Energy Redistribution based Supervisory Control and Communication Systems Project - 6SOP. This project got the initial assistance from Scientific Research Support Fund (SRF) with 180,000JD. The main idea of the proposed project is to generate, distribute and redistribute an electrical energy within at least three different locations/sites at Mutah University campus. The redistribute part is to redistribute an electrical energy where needed among these three locations in the campus. The redistribution process based on intelligent control system provides an affordable, reliable, efficient and sustainable supply of electricity without using an external supply of energy (i.e. electrical grid) as a first step. Using state-of-the-art technological advances in the areas of sensing, communications, control and visualization platforms, the idea can be applied on a small scale system as stand-alone system and measure the saving energy percentage afforded by this project. 7. Solar system for water heating at swimming pool and Student housing building Thermal Solar systems were installed to alleviate the electrical energy consumption for water heating. The installed systems use to heat the water completely during the hot days and help to increase water temperature in other days. text Here



## وحدة تنمية المجتمع



إن خدمة المجتمع المحلي من خلال ما تقدمه الجامعة كمؤسسة علمية حضارية هي الأساس العلمي الصلب للوحدة المجتمعية وهي الخيار الخفي للكامل والتكامل بتحقيق موجهها زائد منظم في الإنتاجية الفردية والجماعية ضمن إطار من العلاقات التي تعكس المشاركة وتوفر ضمانات الأمن الفردي والمجتمعي الذي يأخذ بالحسبان محيطات الحاضر والمستقبل وأماهه ، وبالطاقة من هذا المفهوم عملت وحدة تنمية المجتمع المحلي في جامعة مؤتة والتي تأسست عام 2002 على إحداث التغييرات الإيجابية المطلوبة في حياة الفرد والمجتمع

من خلال برامجها وخططها التنموية على النحو التالي :

1. عقد البرامج التنموية من محاضرات وورش عمل وأيام طيبة مجانية ونشاطات ومؤتمرات لدعم متاور التنمية الثقافية والاجتماعية والاقتصادية لبناء المجتمع المحلي لتحديد احتياجاته ، ووضع أية مناسبة لتخدمه .
2. التنسيق ما بين الجامعة والمجتمع المحلي لتحديد احتياجاته ووضع آرية مناسبة لخدمته .
3. المحافظة على مفردات التراث الأردني وبخاصة في إقليم الجنوب والعمل على كل ما يساهم في تعميم أصالة هذا التراث .
4. العمل على تعميم مفهوم دور المجتمع المحلي في دعم مسيرة الجامعة من خلال الندوات وورش العمل والتواصل المستمر مع قطاعات المجتمع المحلي .

<https://www.mutah.edu.jo/en/pfc/Pages/EnergyConservationProgram.aspx>  
<https://www.mutah.edu.jo/Pages/LocalCommunityDevelopment.aspx>

Revised June, 2022  
Mutah University  
Community Development Unit

