SDG 7 AFFORDABLE AND CLEAN ENERGY

Ensure access to affordable, reliable, sustainable and modern energy for all

Targets and Indicators

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Courses, Theses, Publications

On October 14, 2021, TEDU's University Senate made a commitment to pursue the Sustainable Development Goals (SDGs) to enhance awareness of these issues both at the university and in the local community.

Courses

Two graduate courses offered by Electrical and Electronics Engineering Department and Civil Engineering Department come forward: **EE 562 Economic Operation of Power Systems** aims to equip graduate students with advanced knowledge and skills in

modern power system operation. SDG 7 aims to **"Ensure access to affordable, reliable, sustainable and modern energy for all".** Two learning outcomes of the course serves the **"sustainable" and "modern" energy concept of SDG 7: i)** Apply techniques to forecast load demand, **wind and solar** generation. **ii)** Analyze the opportunities and challenges that emerging distributed energy resources pose for **future electricity industry** operation and control**"**.

The second course is the **CE 571 Sustainable Construction** aims to provide students with the background knowledge on green buildings and the tools and techniques used for green construction. One learning outcome of the course serves the **"sustainable" energy concept of SDG 7: "i)** Distinguish **renewable energy technologies** in terms of their advantages and shortcomings**"**.

Theses

The thesis carried out at Mechanical Engineering Department of TEDU and entitled as "Machine learning based performance prediction of variable speed hydraulic turbines" focuses on Francis type turbines which have a high hydraulic efficiency. A digital twin of a Francis turbine was created by training machine learning models by synthetic data generated by the CFD analyses. Two distinct machine learning models used to create a digital twin structure. The discussion part of the thesis included optimizing efficiency by adjusting the turbine's angular velocity. This study contributes to Target 7.3 of the SDG 7 "..double the global rate of improvement in energy efficiency".

Publications

The article published by TEDU researcher(s) entitled as "A Future Demand Prediction Based Approach for the Design of Pelton Turbines on Irrigation Channels" also supports Target 7.3 of SDG 7. In this study, a sequence-to-one regression methodology utilizing the predictive capabilities of the Long Short-Term Memory (LSTM) algorithm was employed to provide forecasts of flow rate values in the future time periods based on the two-year discharge data of Akbas HEPP Irrigation Canal. Additionally, a study was conducted to optimize the performance of the LSTM design.

The article published by TEDU researcher(s) entitled as "Exploring Renewable Energy on the Coastline of Türkiye: Wind and Wave Power Potential" evaluates Türkiye's wind and wave energy potential along its expansive coastline providing an insight into the **strategic** development and utilization of **renewable energy resources** in Türkiye's coastal regions, offering valuable data for policymakers, energy planners.

Events - Activities

Among the events organized at TEDU to raise awareness on affordable and clean energy, two of them come forward:

Operational Technology: The training on Operational Technology open to TEDU members and students focused on the security of power plants. This training activity supports Target 7.1 of the SDG 7 "and ensures universal access to affordable, reliable and modern energy services".

Image 1. Operational Technology

Solar Factory: The other activity was the site visit to a Solar Energy Factory by the third and fourth year students of the TEDU Mechanical Engineering Department (See Image 2).

Image 2. Solar Energy Factory Visit

Collaborations, Projects, Awards

Projects

Turn off the Lights for a Bright Future: The project titled *"Turn Off the Lights for a Bright Future"* was developed to promote energy conservation and encourage sustainable behavioral change within the community (See Image 3).

Image 3. Turn off the Lights for a Bright Future

In an era marked by increasing energy demand and environmental challenges, the initiative emphasizes the importance of reducing unnecessary energy consumption through the simple yet effective act of turning off lights when not in use. The project involved designing informative brochures and posters containing QR codes that provided additional resources on the environmental and economic impacts of energy efficiency. By distributing these materials and engaging in direct conversations with individuals, the team sought to raise awareness about responsible energy use and its contribution to environmental protection. The initiative highlights how small-scale behavioral changes can collectively contribute to the conservation of natural resources, the reduction of carbon emissions, and the transition toward cleaner and more sustainable energy systems. Through these efforts, the project aligns with global objectives that advocate for accessible, efficient, and environmentally responsible energy consumption.

Campus

In alignment with the university's commitment to sustainable development and efficient resource management, the laboratories and studios were maintained as accessible learning environments for all members of the academic community, including students and staff. To enhance the effectiveness and functionality of the Faculty of Architecture and Design's studio courses, classrooms numbered 203, 205, 208, and 212 on the second floor of Block G were converted into studio spaces (See Image 4).

Image 4. Studios Spaces

During this transformation process, the existing electrical infrastructure was examined, and an updated system plan was developed based on identified needs. A key component of this initiative was the replacement of outdated lighting systems with energy-efficient LED fixtures, contributing to reduced energy consumption and lower carbon emissions. Additional improvements included the installation of polycarbonate wall panels and the design of projection and sound systems aligned with pedagogical and technical requirements. The project also involved market research for sustainable furniture and equipment solutions, ensuring resource-efficient procurement. Completed before the start of the Fall 2024 semester, this initiative reflects the university's efforts to integrate energy-efficient practices into campus development, thereby supporting environmental sustainability and the responsible use of clean energy resources.

To promote sustainable energy management across campus facilities, comprehensive energy efficiency measures have been implemented. All campus buildings are equipped with sensor-based lighting systems and low-voltage LED fixtures, ensuring optimal illumination with minimal energy use. The university employs a building automation system to continuously monitor and regulate the energy infrastructure, while lighting in unused areas is routinely turned off during security inspections to prevent unnecessary consumption. In terms of heating management, daily weather forecasts are analyzed to adjust the operating hours of natural gas systems according to outdoor temperature fluctuations. Radiators throughout the campus are fitted with thermostatic valves calibrated to maintain efficient heat distribution, while additional precautions, such as monitoring the status of doors and windows, are taken to minimize heat loss during winter months. Moreover, sustainable water management practices are integrated into campus infrastructure through the installation of aerators, water-saving faucet heads, and sensor-operated fixtures in wet areas. Collectively, these measures demonstrate a systematic commitment to reducing energy and resource consumption, enhancing operational efficiency, and fostering an environmentally responsible campus environment (See Image 5).

Image 5. Metrics about Resource Consumption

Energy and fuel consumption across the campus are systematically monitored through a comprehensive tracking and control system designed to enhance operational efficiency (See Image 6). This system enables the identification of consumption patterns and facilitates the implementation of corrective measures to prevent unnecessary energy use. Through continuous data analysis, strategies for optimizing energy performance are developed and applied, leading to measurable improvements in efficiency and a significant reduction in the institution's overall carbon footprint. These practices reflect the university's commitment to sustainable energy management and the responsible use of resources to support a more energy-efficient and environmentally conscious campus infrastructure.

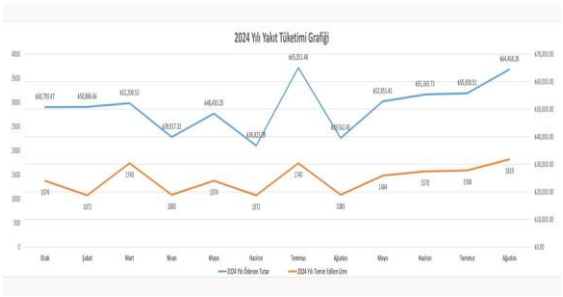

Image 6. Energy and Fuel Consumption Tracking

Energy consumption across the campus is systematically monitored on a monthly and annual basis. The collected data are analyzed according to average consumption per user and per student, allowing for the identification of consumption patterns, potential increases, and areas requiring improvement. These analyses inform the

preparation of budget projections related to energy expenditures, supporting efficient resource allocation, maintaining control over energy costs, and guiding the implementation of targeted energy efficiency measures. This structured monitoring and analysis framework not only enhances financial sustainability but also contributes to the optimization of energy use and the reduction of the university's overall environmental footprint, demonstrating a commitment to sustainable energy management.

TEDU prioritizes the protection of natural resources and the promotion of conscious energy use to ensure a sustainable future. As part of its sustainability initiatives, the university has implemented an energy efficiency plan aimed at reducing overall energy consumption across the campus. Through targeted energy-saving measures, TEDU achieved a **14.74% reduction in electricity consumption** and a **44.73% reduction in natural gas consumption**. These achievements demonstrate the effectiveness of the university's ongoing energy management strategies and its commitment to responsible resource use. In addition, during **Energy Efficiency Week**, the university conducted an awareness campaign encouraging students and staff to use energy more consciously, further reinforcing a culture of energy efficiency within the institution.

Evidence:
https://www.linkedin.com/posts/ted-%C3%BCniversitesi_sdg7-sdg9-sdg11-activity-7282315845614120960-tCV-/?originalSubdomain=tr

Throughout the academic year, the campus's most frequently used spaces are systematically monitored, and their operating hours are scheduled and adjusted based on user demand. Energy consumption is considered a critical factor in this planning and evaluation process. Accordingly, the lighting systems, electrical infrastructure, and other energy-related equipment in these areas are periodically assessed to ensure alignment with energy-efficient technologies. Recent evaluations identified that corridor lighting in six campus buildings remained active for extended periods despite the absence of occupants. In response, all corridor lighting systems were upgraded to motion-sensor technology, ensuring illumination only when movement is detected. This intervention has effectively eliminated unnecessary energy use and has reinforced a culture of energy efficiency across the campus, demonstrating the university's commitment to sustainable energy management.

Energy consumption across the campus is systematically monitored on a monthly and annual basis to ensure sustainable energy management. Collected data are analyzed per user and per student, allowing for the identification of consumption patterns, potential increases, and areas requiring efficiency improvements. Insights from these analyses inform the preparation of energy-related budget projections, facilitating effective resource allocation and cost control. Furthermore, the findings guide the implementation of targeted energy efficiency measures, such as the optimization of lighting and HVAC systems. This structured approach not only enhances operational and financial sustainability but also supports the university's commitment to reducing its environmental footprint and promoting responsible energy use.

The TEDU College Campus Rooftop Solar Power Plant (SPP) Project has been implemented to harness renewable energy, specifically solar power, for electricity generation, aiming to reduce greenhouse gas emissions, promote environmental protection, and contribute to sustainable economic development. The project reflects a comprehensive approach to sustainability by integrating environmental, social, and economic dimensions. At the İncesu Blocks, the system was designed with a total installed capacity of 123.2 kWp using 224 PV panels, while at the Aksu Blocks, a capacity of 88 kWp was achieved with 160 PV panels (See Image 7). Both systems were installed gradually between February and April 2025. Although sufficient operational data are not yet available for a full performance evaluation, the project has successfully facilitated the institutional adoption of

renewable energy and taken concrete steps toward reducing carbon emissions. Ongoing monitoring and evaluation of energy production will allow for more precise reporting of performance and further assessment of the project's contributions to sustainable energy access, efficiency, and environmental sustainability.

Image 7. Solar Panel at TEDU

Since 2022, TEDU has undertaken a series of initiatives in collaboration with ATALIAN EVD Energy to strengthen energy management practices across the campus. Within this partnership, energy consumption data are systematically collected and analyzed, enabling the identification of areas for efficiency improvements. An Energy Audit was conducted to assess current energy usage patterns, and a set of targeted energy-saving measures was subsequently developed. The implementation of these measures is ongoing, and their effectiveness is continuously monitored and evaluated. These efforts support the university's commitment to optimizing energy use, minimizing unnecessary consumption, and reducing carbon emissions, thereby contributing to sustainable energy access and efficiency in line with global energy sustainability goals.

Moreover, TEDU has become one of Türkiye's first accredited sustainability reporting training institutions. In line with the Türkiye Sustainability Reporting Standards (TSRS S1 and TSRS S2) introduced for major companies, the Public Oversight Authority (KGK) accredited TEDU, in cooperation with ANKON, as an authorized provider of sustainability reporting education. With this accreditation, TEDU is among the first six institutions in Türkiye authorized to deliver sustainability reporting training programs. These programs aim to equip participants with the knowledge and skills necessary to prepare sustainability reports, focusing on key areas such as social responsibility, environmental impact, and economic performance. By enabling professionals to identify and report on sustainability-related risks and opportunities within their organizations, TEDU contributes to the creation of a more sustainable future.

Evidence: https://www.tedu.edu.tr/en/whats-happening-tedu/tedu-one-turkeys-first-accredited-sustainability-reporting-training

Within this framework, through its Continuing Education Center (TEDÜSEM), TEDU offers various programs that raise awareness among professionals and the local community about sustainability, energy efficiency, and clean energy. One of these programs, the ESG and Sustainability Workshop, provides comprehensive training on Environmental, Social, and Governance (ESG) principles and their integration into corporate strategies. The course covers global sustainability trends, the Sustainable Development Goals (SDGs), sustainable finance, the circular economy, and the Paris Climate Agreement. Addressing the environmental dimension of ESG — including energy efficiency and sustainable resource management — this program enhances participants' understanding of clean energy transitions and fosters the adoption of environmentally responsible practices across sectors.

Evidence:
https://sem.tedu.edu.tr/course/esg-ve-surdurulebilirlik-atolyesi

TEDU maintains ongoing collaboration with the Republic of Türkiye Ministry of Energy and Natural Resources and the Council of Higher Education (YOK) to advance energy and water efficiency and implement conservation measures. Within this framework, official responses are

systematically prepared to address formal requests, and relevant consumption data are regularly shared with these institutions. Furthermore, the university's energy and water usage data are periodically recorded in the portal system established by the authorities. This structured approach ensures institutional transparency, facilitates data-driven decision-making, and aligns the university's practices with national policies promoting sustainable energy management and efficient resource use.

TEDU actively collaborates with the Republic of Türkiye Ministry of Energy and Natural Resources and the Council of Higher Education (YOK) to promote energy and water efficiency and implement sustainable conservation measures. In this context, formal requests are systematically addressed, and relevant consumption data are regularly shared with the respective institutions. Furthermore, the university's energy and water usage data are periodically recorded in the official monitoring portal established by the authorities. This coordinated approach enhances institutional transparency, enables evidence-based decision-making, and contributes to the advancement of national policies on sustainable energy management and efficient resource utilization.

Climate Ambassador Student Representation

As part of TEDU's commitment to promoting sustainability, clean energy awareness, and climate action, a student has been appointed as a Climate Ambassador to actively contribute to institutional sustainability initiatives. The Climate Ambassador serves as a member of the University Sustainability Commission, representing the student community and ensuring that student perspectives are reflected in decision-making processes related to sustainability and energy efficiency. Through this role, TEDU strengthens youth engagement in advancing the United Nations Sustainable Development Goal 7 (Affordable and Clean Energy) and fosters a culture of environmental responsibility and climate-conscious leadership among its students.

Evidence:
https://sustainable.tedu.edu.tr/en/our-team