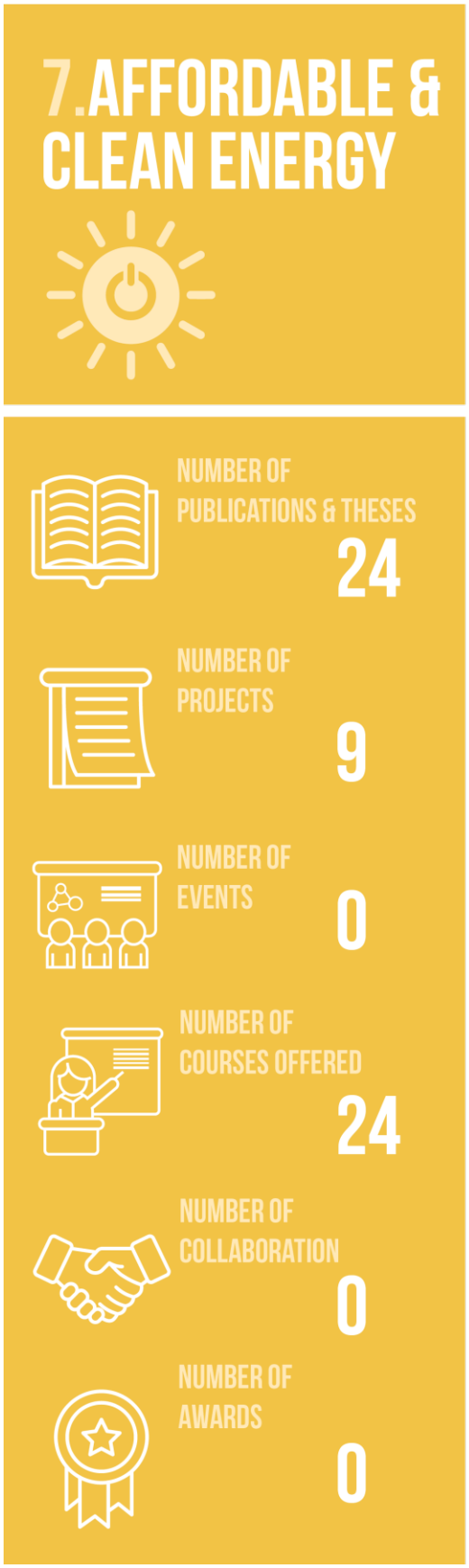
THE IMPACT RANKINGS

7

AFFORDABLE AND CLEAN ENERGY



SDG 7 AFFORDABLE AND CLEAN ENERGY

Ensure access to affordable, reliable, sustainable and modern energy

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, 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.

In 2023, the thesis entitled as “**Clustering analysis on G20 countries' climate change efforts regarding the energy sources”** has focused on conducting a clustering analysis of G20 countries to recommend similar renewable energy policies for countries within the same cluster. This approach used in the thesis emphasizes the fact that a country's characteristics extend beyond its economic activities and energy consumption. So, by grouping countries, it becomes possible to develop a common set of policies tailored to each cluster's unique attributes. This cohesive

decision-making and policy implementation can streamline the transition to new energy sources and produce quicker results. The findings in this thesis *illustrate a model for creating a unified decision-making process for the clusters, emphasizing the significance of collaborative efforts in addressing climate change.*

TEDU researchers have also authored several research papers which contribute to the affordable and clean energy research. One of the articles is entitled as **"A univariate time series methodology based on sequence-to-sequence learning for short to midterm wind power production".** In their article the authors focused on Turkey's largest wind farm, located in Manisa, within the Aegean Region. The focus of this study was to model and forecast the electricity output of the wind farms in Manisa using a univariate sequence-to-sequence learning approach. A key strength of the proposed model is that it relies solely on its own lagged values for making predictions. In addition to providing strong forecasts for hourly electricity production, the model can also be adapted to predict the minimum, maximum, and average electricity output over a specified range with minor adjustments.

In another article entitled as "**Developing and implementation of an optimization technique for solar chimney power plant with machine learning**" and published by TEDU researchers, the effectiveness of Artificial Neural Networks (ANN) and Adaptive Neuro-Fuzzy Inference Systems (ANFIS) in the optimization of the geometry of a solar chimney power plant (SCPP) is investigated. The optimization of the SCPP geometry improves power generation and reduces time and errors associated with numerical or experimental optimization methods. The findings of the paper indicate that well-structured ANN and ANFIS models produce optimized geometries that outperform traditional numerical results.

Events - Activities

No events and activities took place regarding this SDG.

Collaboration, Projects, Awards

Students and researchers participated and coordinated 9 projects in total regarding the affordable and clean energy SDG.

The COST action "**Cyber-Physical Systems and Digital Twins for the Decarbonization of Energy Intensive Industries (CYPHER)"** is an innovative European collaboration aimed at decarbonizing Energy-Intensive Industries (EIIs) through cutting-edge advancements in combustion, fluid dynamics, and data science. With a network that spans 33 countries and includes academic experts, industrial partners, and policymakers, CYPHER is at the forefront of sustainable industrial transformation. CYPHER is committed to enhancing the understanding of *Renewable Synthetic Fuels* (RSFs) combustion, developing high-fidelity simulations, creating hybrid physics-based data-driven models, and implementing self-updating digital twins. By leveraging multidisciplinary research, CYPHER strives to transform EIIs, significantly reduce greenhouse gas emissions, and foster a sustainable future.

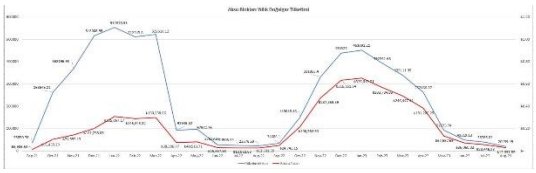
Campus

*Our university's laboratories and studios are open for use by all our members (staff and students), especially after class or on weekends, if requested. This process is closely coordinated with the faculty member or department head who uses the relevant area and kept ready for optimum use of education and research areas, especially ensuring that our students can benefit from these areas. Within the scope of the needs determined for more effective and efficient use of the Faculty of Architecture and Design studios, three classrooms numbered 203, 205 and 207located side by side on the 2nd floor of H block were combined, their electrical infrastructure was rearranged, polycarbonate sheets were laid on their walls, projection and sound systems were installed, their lighting was changed to energy-efficient LED lighting considering energy efficiency, and other specified furnishings were purchased and transformed into a larger and more useful studio.

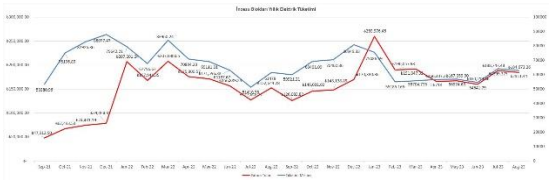
*In order to ensure energy efficiency in the buildings in our campus, sensor lighting and low voltage LED lighting are preferred. Additional measures are taken to reduce daily/monthly/annual energy consumption amounts. Lighting of unused areas is turned off during patrols of our security team. In addition, the energy infrastructure in the buildings is monitored through the automation system.

Daily weather forecasts are frequently monitored for natural gas usage and in this way, the working hours of the heat boiler system are arranged in accordance with the air temperature. Thermostatic valves are used in the radiators of all physical areas. Valve settings are generally fixed to position 3. In addition, in order to ensure energy efficiency, door and window open times are monitored by the support teams in the field in order to prevent heat loss, especially in winter months. If necessary, they are left open for a short time only for ventilation. Doors and windows are kept closed at other hours.

In order to take the necessary precautions in water usage, aerators and economical faucet mouths are used in faucets in wet areas. At the same time, sensor faucets are used extensively in our campus.



*Carbon reduced thanks to the monitoring and control system designed for energy and fuel consumption.



*Energy consumption amounts in our campus are monitored monthly/yearly. Consumption is

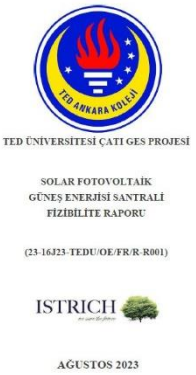
calculated based on the amounts per user and student in our campus. Based on these calculations, projections for budget calculations are prepared and reported.

* The most used areas on our campus are monitored during the academic year. The usage hours of these areas are determined according to the demands of our users. Energy usage is also considered within this planning and evaluation study. The lighting, electrical infrastructure and other energy equipment of the area are evaluated for whether they are in a technology for efficient use. Recently, it has been determined that the lighting in the pedestrian underpass connecting our two campuses and having a lot of lighting is on all night long. After the evaluation, the infrastructure of all lighting in the area has been made sensor-based and it has been ensured that they are on only when needed (while pedestrians are passing). This change has prevented energy waste. In addition, the valves in the heat boiler room have been covered with valve jackets to prevent heat loss.

* Energy consumption amounts on our campus are monitored monthly/yearly. Consumption is calculated based on the amounts per user and student on our campus. Based on these calculations, budget projections are prepared and reported.

In addition, annual comparisons are made based on the amounts per square meter of our university's energy use.

* Within the scope of the solar energy system project on the agenda of our university, it is considered to install solar energy systems on the roofs of our university blocks. In this direction, feasibility studies for solar energy systems have been completed with a consulting firm, a report has been created on the subject and the process has been brought to the tender stage. After the completion of the process in the upcoming period, studies are ongoing to put the system into operation.



*Since 2022, many activities have been carried out within the scope of energy management studies in our campus with the contract made with ATALIAN EVD Energy. Energy Study was carried out in order to ensure efficiency based on energy consumption data, and saving measures were determined depending on consumption values. The process is carried out within the scope of the determined measures.

*There is constant communication with the Ministry of Energy and Natural Resources and the Council of Higher Education regarding energy and water efficiency and saving measures. Responses to requests received through official letters and requested data are shared. Consumption data is entered into the developed portal system.