Sustainability Performance of Istanbul Technical University (ITU): Lessons Learned from UI Green Metrics



Kadriye Elif Maçin, Osman Atilla Arikan, Ebru Acuner, Börte Köse Mutlu, and İsmail Koyuncu

Abstract The UI Green Metric ranking is a significant initiative that has assessed the sustainability of universities around the world since 2010. This study aims to evaluate ITU's sustainability performance using this system and to share the lessons learned during the process. Making the university campus more sustainable requires a long-term commitment and dramatic shifts from a business-as-usual scenario. The "Green Campus" project was initiated by ITU in 2013 to create a barrier-free and nature-friendly university and it was recently updated to the "Sustainable Campus" concept. Following on from this, the Sustainability Office was established in 2021 and has a set of commissions addressing 17 Sustainable Development Goals. The "Climate Action Plan" and "Gender Equality Plan" were also published in the same year, and sustainability reports have been published annually. ITU proclaimed 2023, the 250th anniversary of its establishment, as the "Year of Sustainability" and the interdisciplinary M.Sc. program in Sustainability welcomed its first students in the Fall semester of 2023–2024. As a result, ITU was awarded as the Most Sustainable University in the Middle East and ranked 46th globally in the UI Green Metric 2023. On the other hand, ITU could not reach the desired levels in the "Energy and

K. E. Maçin (✉) · B. K. Mutlu
Department of Environmental Engineering, Istanbul Technical University, Maslak/İstanbul, Turkey

Sustainability Office, Istanbul Technical University, Maslak/İstanbul, Turkey
e-mail: macin@itu.edu.tr; kosebo@itu.edu.tr

O. A. Arikan · İ. Koyuncu
Department of Environmental Engineering, Istanbul Technical University, Maslak/İstanbul, Turkey
e-mail: arikan@itu.edu.tr; koyuncu@itu.edu.tr

E. Acuner
Sustainability Office, Istanbul Technical University, Maslak/İstanbul, Turkey

Energy Institute, Energy Planning and Management, Istanbul Technical University, Maslak/İstanbul, Turkey
e-mail: acuner@itu.edu.tr

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2026

Walter Leal Filho et al. (eds.), *Green Metric in Higher Education- Measuring and Reporting on Sustainability Initiatives at Higher Education Institutions*, World Sustainability Series, https://doi.org/10.1007/978-3-032-00361-4_26

Climate" category. Projects and investments in the future should focus more on renewable energy and smart building topics as they become more prominent. Consequently, the findings of this study could be beneficial for universities wishing to navigate a sustainability transition.

Keywords Green campus · Higher educational institutions (HEIs) · University · Sustainable development goals · Sustainable campus · Green campus

1 Introduction

Universities have a significant impact on sustainability, especially as they contribute to the education of society at large. Historically, the Stockholm Declaration was the beginning of the official introduction of sustainability at universities in 1972 (UN 1972). Today, the 17 Sustainability Development Goals (SDGs) published by the United Nations (UN) in 2015 can be regarded as the most important roadmap that directs universities towards sustainability (UN 2015). Universities are tasked with reducing negative environmental, economic, and socio-cultural impacts, improving health and well-being, and spreading sustainability-related values throughout the world (Dziubaniuk et al. 2022).

Taking positive steps on a small scale, such as cities and even university campuses, is crucial to addressing global problems like climate change, since approximately 75% of anthropogenic greenhouse gas (GHG) emissions are caused by cities. Successful transition to sustainability is greatly aided by Higher Educational Institutions (HEIs), especially when it comes to bridging the gap between theory and practice in urban areas (Apaydın 2019). The consumption of materials, energy, and water is necessary for university campuses to carry out education and research processes (Alshuwaikhat and Abubakar 2008). For instance, the education sector is responsible for 40% of China's total electricity consumption in the public sector (Yuan et al. 2013). In the United States, universities account for around 2% of the total GHG emissions, which is roughly equivalent to the emissions of all commercial airplanes or landfills (Shea et al. 2020). Hence, university leaders are now focusing on climate change mitigation/adaptation and campus sustainability as a global concern (Maçin et al. 2021).

Specific best practice examples for modifying the education system to achieve the SDGs can be beneficial to other universities facing similar challenges. In this scope, the "*Green Campus"* project was initiated by Istanbul Technical University (ITU)-Türkiye in 2013 to create a barrier-free and nature-friendly university, which was more recently updated to the "Sustainable Campus" concept. Additionally, the Sustainability Office (SO) was established in 2021 together with a set of commissions addressing 17 SDGs. The "*Climate Action Plan (2021-2048)"* and "*Gender Equality Plan (2021-2026)"* were also published in the same year and sustainability reports have been published annually for 2021–2023. ITU proclaimed 2023, its 250th anniversary, the "*Year of Sustainability"* (ITU 2024a). Moreover, the

interdisciplinary *M.Sc. program* in Sustainability welcomed its first students in the Fall semester of 2023–2024.

Although the idea of creating a green campus originated in the 1970s, it has become increasingly important since the 2000s (Maçin et al. 2020) considering the sustainability concept. UI Green Metric was created by the University of Indonesia in 2010 (UI GreenMetric 2023). It is a significant initiative that offers an international assessment of the sustainability of HEIs (Suwartha and Sari 2013). It consists of six main categories: Setting & Infrastructure (15%), Energy & Climate (21%), Waste (18%), Water (10%), Transportation (18%) and Education (18%) (Fig. 1) (UI GreenMetric 2023). Even though the percentage weight of categories did not change after 2012, the indicators within the categories have changed through the years. For instance, the Energy & Climate category was updated in 2015 to include new indicators on carbon footprint (Maçin et al. 2020). As living laboratories, the role of universities makes them ideal for impact evaluations and feedback. This study therefore aims to evaluate ITU's sustainability performance using UI Green Metric system and share the lessons learned during the process.

This paper continues with five main sections. The next section commences with methodology of the study and then green campus activities at ITU prior to 2020, which encompasses major topics such as energy, water, waste, and biodiversity was explained. These are followed by a section on sustainable university projects and activities after 2020. In the fourth section, the UI Green Metric results of ITU are introduced to understand the links between the sustainability projects on campus and UI Green Metric indicators. The fifth section discusses the overall results and suggests actions required to ensure a more sustainable and climate-friendly campus. Finally, the conclusion specifies the limitations and the planned projects.

2 Methodology

The both quantitative and qualitative analyses was conducted in this research using a mixed-method approach that involves three steps: (1) data collection, (2) data processing, and (3) data visualization. For the first step, a literature search was

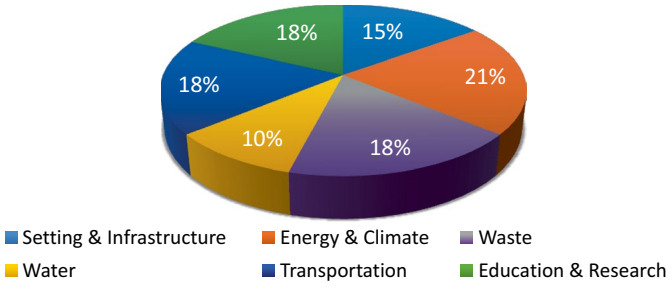


Fig. 1 UI Green Metric—Scoring System

conducted using the keywords “green campus”, “UI GreenMetric”,"sustainable development”,"HEIs” and “university”. Additionally, the ITU’s official website and annual reports were examined. Semi-structured interviews were also conducted with campus on-site workers and the University Rectorate personnel to gain insight into day-to-day operations. For the second step, all obtained data were processed on the basis of ITU’s sustainability journey. Furthermore, to understand the UI GreenMetric contribution, the UI GreenMetric results between 2017–2020 and 2020–2023 were comparedand changes of ITU’s performance were analyzed. For this purpose, the official UI GreenMetric website’s archive ranking results were processed using an Excel file. For the third step, the ITU rankings and scores were analyzed to determine if there is a correlation between the green campus followed by sustainable university projects and UI GreenMetric performance. Results were visualized by using Excel graphs.

3 Sustainability Activities of Istanbul Technical University

Based on 2023 figures, there are 1055 administrative staff, 2330 academic staff and 38,287 students at ITU (ITU 2024b).This section summarizes the sustainability activities of ITU (Fig. 2) before and after 2020, considering studies mainly at Ayazaga Campus, the biggest of 5. One of the campuses is located in Asia and four in Europe.

3.1 BEFORE 2020: Green Campus

“ITU Green Campus” project was started in 2013 in the Ayazaga campus, the main campus of five, and plays a major role in terms of the green infrastructure of the Maslak area (Acuner et al. 2023). Maslak is a rapidly developing part of Istanbul, characterized by high-rise buildings and very high land value. In fact, Maslak is one of the main finance and commerce centres of Istanbul. Within this region, the Ayazaga campus covers an area of 1,540,000 m^2.

The main aim of this project was to achieve a “barrier-free” and “nature-friendly” university model. In the green campus project, the intention was to implement an



Fig. 2 ITU Sustainability Activities Timeline since 2013

exemplary method system for medium-scale sustainable development programs in ITU Ayazağa Campus as a pilot study and to make changes as stated below:

- To provide a sustainable living culture,
- To create an aesthetic campus with an ecological and unique identity,
- To prepare a safe, 24-h campus environment,
- To be a pedestrian-friendly, bicycle-friendly, and barrier-free campus,
- To provide more sports and healthy life opportunities,
- To support recycling and the zero-waste movement,
- To give importance to biodiversity.

The major strategies concerning carbon, water, waste, biodiversity and mobility management to reach these aims are summarized below.

Minimizing carbon emissions is an important aspect of the green and sustainable campus. Studies were conducted to increase energy efficiency within the boundaries of ITU campuses, based on the *Turkish Energy Efficiency Law"* (Official Gazette 2007). Staff and students were encouraged to come to the campus by public transportation rather than by car.

Rainwater harvesting and **irrigation** at ITU involves collecting 77,000 m^3 of rainwater, which reaches the **ITU Lake** through surface flow, and using it for irrigation of green areas of the campus. This decreases the demand for fresh water significantly. In 2016, the interior and surroundings of the ITU Lake were rehabilitated. Taking advantage of the terrain can help reduce energy consumption when transferring water to irrigation systems. The Lake provides a habitat for fish, birds and insects. Some scientific studies are also carried out in the lake without disturbing the natural life, and the rowing team and pedal boat club can also train in the lake. ITU *Abdülhakim Sancak Mosque* uses irrigation water harvested from its roof, and more recently constructed green buildings on campus also have graywater collection systems.

ITU has a **Waste Management** Directive that is compatible with the National Waste Framework (ITU 2020a). The directive is accessible to the public and contains measures to reduce and reuse packaging waste, as well as other waste materials. In addition, the purpose of this statement is to emphasize the **sustainable management of supply chain** at ITU campuses within the responsibility and authority of the ITU Rectorate. The supply chain of ITU takes the local producers into account for its purchases. The aim of this practice is to reduce environmental, social and economic impacts through sustainable purchasing. This policy is adopted to strengthen the SDGs within ITU and ensure local development. The ITU Waste Management Guidelines specify policies on how to handle, store and transport hazardous substances and how to minimize waste in general. Denim bags and pencil holders were made by combining waste fabrics within the upcycling project. Refillable water bottles, recyclable coasters and stationery materials were designed within the scope of the ITU Green Campus Project. Waste experts trained staff and students on waste reduction and recycling. A program was conducted to collect plastic bottle caps separated at source. The campus area currently has separate containers for all types of waste at source. In order to observe the results of waste

management studies, waste characterization was carried out in pilot regions for a week in 2019 and 2022. The campus cafeteria's organic waste is accepted by the Sustainable Energy Production Facility. The Green Campus project provided an important opportunity to increase the production of renewable energy (biogas) and increase awareness among internal stakeholders.

Under the ITU Traffic Directive, the **pedestrian priority** system was put in place. There are 8 locations where you can rent **bicycles** (ITU 2021a). ITU Ayazağa campus consists of 3 electric vehicle charging stations, each with 1 rental electric vehicle. As a result, ITU aims to reduce the greenhouse gas contributions of both intra-campus traffic and the traffic caused by the need for students and staff to enter/exit the campuses and achieve sustainable transportation.

To ensure **barrier-free life** at ITU; pavement landscaping works, employment of visually impaired and wheelchair users in the Disabled Unit, and structuring of the campus with the understanding of "Barrier-Free Life" with regard to the experiences of employees was carried out. ITU supported the employment of disabled people by opening the "Down Cafeteria" and establishing the "Textile Design Center for the Disabled" with the Prestige Club, one of our student clubs.

Reptiles, squirrels, hedgehogs, cats and dogs are among the other common types of animals living on a campus rich in **animal species**. In areas where dogs gather on the campus, cabins were constructed where they can meet their eating and drinking needs. All dogs and cats were vaccinated and a veterinarian was assigned to check their health status. Increasing numbers of crows and magpies on the Ayazağa Campus was observed. Bird nesting boxes were placed in wooded areas throughout the campus to encourage small birds. As a result, there was an increase in the sparrow population.

Design and application studies were carried out in accordance with the understanding of **sustainable landscapes** (ITU 2019). Realization of detailed solutions include the use of materials with high water permeability, strengthening the perception of space, giving priority to pedestrian/bicycle use, allowing comfortable movement of disabled users and contributing to the sustainability of natural life. Preferring plant species that consume less water, suitable for the climate, while adding character to the space in all seasons, planting schemes was arranged in accordance with campus plant arrangement principles. Irrigation systems and equipment suitable for plant type and area characteristics were selected in order to provide **irrigation water** necessary for the survival of plant material and to reduce water consumption. Sustainable landscaping studies were carried out with the joint cooperation of Istanbul Regional Directorate of Forestry, Istanbul Metropolitan Municipality and ITU Faculty of Architecture Landscape Department academicians. The purpose of these studies was to protect the green area of ITU Ayazağa Campus while enriching it. A landscape approach was adopted whereby projects and regular maintenance were conducted according to the principles of climate and landscape design on campus. An inventory of the natural life of the campus was performed and the trees in the inventory were classified. Experts guided the reduction and relocation of diseased and unhealthy trees to new areas where they could grow more easily. During the transportation process, special vehicles were preferred that would not damage

the roots of the trees. After providing the appropriate distance between the trees with thinning processes, the trees benefited more from the sun. Climate-appropriate trees such as redbud, sweetgum, plane tree, and linden were planted inside the campus. The project of preparing and recording the **biodiversity** database at ITU Ayazağa Campus was completed. With the "QR Coded Plant Identification System" project, the genetic resources of plants belonging to endemic plant species on the campus were created and recorded in the QR code system directed to the ITU website.

Facilities and operations were the initial steps in the start of green campus activities at ITU. However, these activities have been continued with sustainable university projects that include sustainable teaching, research, student engagement, industry interface, governance, and partnership.

3.2 AFTER 2020: Towards Sustainable University

ITU has been making significant progress in achieving sustainable development by expanding its green campus activities, conducting teaching and research, implementing campus greening initiatives, and engaging with stakeholders. As part of this, firstly the **'ITU Sustainability Office'** was established in November 2021, which is affiliated to the Rectorate. Student clubs, academicians, and administrative staff are active in the Sustainability Office. According to the administrative structure of Sustainability Office, there are various thematic commissions formed for the 17 Sustainable Development Goals. These commissions consist of academicians and administrative staff. A student community is also involved. The Sustainability Office was established with a hybrid system of bottom-up and top-down approaches. While issues pertaining to sustainability are managed by the office, Commissions contribute and work in line with the activities of the office. **Commissions** consist of special experts who have the ability to analyze the context of the university by identifying actual and potential impacts (ITU 2021b). For instance, *ITU Biodiversity, Conservation of Ecosystems and Sustainable Use Commission* organizes bioblitz events every year (ITU 2022a). Volunteers and field experts gather for these bioblitz events to record and identify species living on campus. Commissions are also assigned to SDGs according to their expertise and help progress towards achieving each of the 17 SDGs (Fig. 3). In this way, ITU's sustainability progress is being verified by a comprehensive system which is then calibrated around indicators.

ITU has demonstrated its commitment to sustainable education in connection with the SDGs by expanding the number of related courses. Sustainability courses are available at each level of higher education. Most crucially, there is an SDG-related English course that is mandatory for undergraduate students in every department. All **courses** on sustainability are listed on the SO website for easy access by students (ITU 2024c). Also, primary schools are educated on how to save water and the importance of water in our lives through the Water Education program. An interdisciplinary, 100% English, Sustainability **Master Program** (M.Sc.) was started in

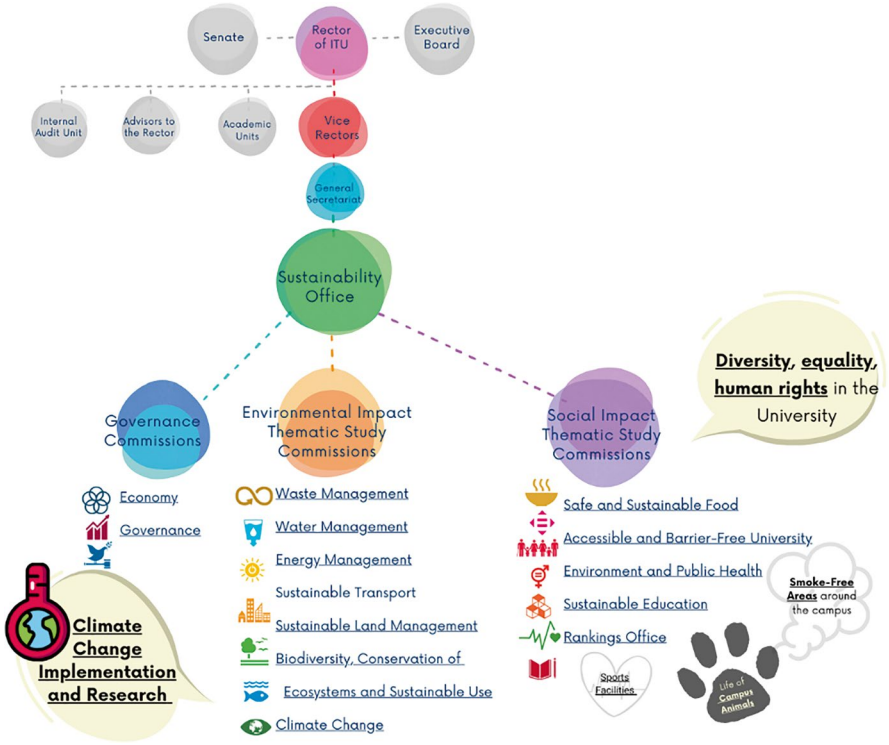


Fig. 3 ITU Sustainability Commissions and SDGs

the Fall Semester of 2023–24 (Fig. 4c). Graduates from 4-year undergraduate programs can apply to the Program. Students of the Sustainability M.Sc. are encouraged to bridge the gap between industry and academy through their thesis studies.

ITU has ongoing protocols signed with many **industry stakeholders** that students can benefit from. In addition, the students are guided to do their thesis with international collaborations within the scope of the European Engineering Learning Innovation and Science Alliance (**EELISA**) Project (EELISA 2021). EELISA is focused on leading the way towards the future university, improving the quality and competitiveness of European higher education, and helping to transition to green and digital technologies in Europe. EELISA covers three European regions, EU countries such as France, Germany, Italy, Spain, Hungary, and Romania along with an accession candidate (Türkiye) and a non-EU European country (Switzerland). More than 194,000 students and 50,000 graduates are represented annually by the EELISA alliance, with 18,500 academic and 12,000 administrative staff combining complementary strengths and profiles across Europe. ITU joined EELISA upon its establishment in 2020. EELISA aims to achieve the 2030 Agenda for Sustainable Development and all the SDGs and to transform European higher education



Fig. 4 (**a**) Gender Equality Plan (**b**) Sustainability Reports (**c**) M.Sc. Program (**d**) Climate Action Plan (CAP)

institutions along this path. ITU has also been a member of **UN SDSN** (Sustainable Development Solutions Network) since 2016.

Students from the ITU Environmental Engineering Club have been sharing information on sustainable solutions to environmental and ecological problems, and environmentalist designs with a wider audience through their public website called Ekolojika since 2013. ITU Zero Waste and ITU Environmental Engineering Clubs conducted a project to assist the 2023 Kahramanmaraş earthquake victims (ITU 2023a). With this project, 1190 kg of Waste Electrical and Electronic Equipment (E-Waste) collected in the E-Waste collection box placed in the Ayazağa Campus and its recycling were ensured with the licensed company. Income generated from the recycling of e-waste has provided scholarships for three earthquake victim students. In addition, ITU Environmental Engineering Club has been conducting the Tears of Water project since 2008 (ITU 2023b).It encourages children to understand the importance of nature and especially water, to protect water resources and to bear the responsibility of leaving a clean water source to future generations. In addition, to raise environmental awareness in children by telling them about the importance of nature; by teaching children sustainable lifestyles such as recycling and energy saving. The ITU Volunteering Club's 'Another Path, Some other way' project aims

to aid high school students who are struggling financially or personally to demonstrate their interest in education and attend private tutoring.

In terms of studies related to publication, ITU put out the *Sustainability Reports* for 2020 and 2021, and also the *Gender Equality Plan and Climate Action Plan for 2021–2026* (ITU 2020b) (Fig. 4). Since 2005, the *ITU Journal of Environment, Climate and Sustainability* has been publishing articles on water resources (Dergipark 2024), water quality, pollution, and marine sciences. The journal's content was enhanced to include subjects related to climate change and environmental sustainability in 2021.

Sustainability reporting has been observed to offer various benefits to educational institutions, such as reducing utility costs and enhancing their international reputation (Bekaroo et al. 2019). The writing methodology of the ITU **sustainability report** is based on the two best known and essential standards in sustainability reporting (ITU 2022b). *THE Impact Ranking Methodology* and *Global Reporting Initiative (GRI)* (Fig. 4b) (Global Reporting Initiative (2016).

ITU established a **Gender Equality Unit** in the Women's Studies Center in Science, Engineering, and Technology (WSC in SET) to monitor, evaluate and benchmark the objectives of the Gender Equality Plan (GEP). The Gender Equality Unit develops monitoring methods for equality status which can be used in the faculties and departments. WSC in SET aims to support and enhance gender equality in science, engineering, technology and art. Increasing the accountability and the activities and expanding the database of female statistics in these areas, improving the visibility and contribution of women in social and academic life, and collecting and updating the related documents are among the main goals of the centre. The centre also expects to have a significant impact on the gender mainstreaming of the undergraduate and graduate education of the university. ITU published 2021–2026 GEP in 2020 (ITU 2020c).

ITU Climate Action Plan (CAP) committed to an institutional plan to attain net-zero GHG emissions and increase the University's sustainability research and instructional initiatives (Fig. 4d). This report aligns with the GHG Protocol Corporate Standard in its carbon emission calculations. The 3 scopes of ITU carbon emissions were summarized according to the GHG Protocol. Türkiye has committed to reduce its emission increase by 41% by 2030. Another important goal of Türkiye in the fight against climate change is to achieve "net zero carbon emissions" by 2053. ITU is a pioneer university in complying with national plans from past to present. ITU has agreed to be Carbon Neutral by 2048 (ITU 2020b).

Moreover, the targets on energy efficiency are determined in the **Energy Efficiency Strategy Document** (2012–2023) and the strategic approaches included in the National Energy Efficiency Action Plan (2017–2023) (IEA 2022) have helped to determine a path for increasing energy efficiency on campus. The initial stage of energy efficiency studies involved considering the buildings on the university campuses. The condition of buildings, the years of construction, building classifications, and monthly energy consumptions were considered. In this context, the "ITU Energy Efficiency Action Plan" was prepared (ITU 2023c) taking into account the best practices in Türkiye and the world. The strategies that could be applied to

increase the energy efficiency of ITU campuses were developed. Adopting a safe, economical and aesthetic lighting approach with low consumption (mostly using LED technology) and realizing applications with long-lasting lighting products within this framework will increase energy efficiency. Especially regarding road lighting, joint projects were carried out by the Ministry of Energy and Natural Resources (MENR) and Türkiye Electricity Distribution Inc. The "Energy Efficiency Project in Public Buildings in Türkiye" was funded by the World Bank, under the financial guarantee of the Ministry of Treasury and Finance, with the support of MENR, and in Ayazağa campus five sample project applications were determined by the Ministry of Environment, Urbanization and Climate Change, General Directorate of Construction Affairs. Studies were carried out on the basis of increasing energy efficiency in 100,000 buildings integrating renewable energy (rooftop solar power plants). Electric vehicle charging stations are located at the ITU Ayazağa Campus. In addition, *'ITU Smart Campus'* and *'ITU Electrical Autonomous Shuttle'* projects have been conducted (Fig. 5d).

Using electro-mobility service, bicycle, and e-scooter systems can aid in limiting the use of motor vehicles and reducing emissions. The Graduate Education Institute Building located in ITU Ayazağa Campus has a LEED certificate and can produce its own **energy** through its rooftop solar power plant. The Faculty of Electrical and Electronics and ITU Abdulhakim Sancak Mosque have solar panels as well. The potential solar energy on the roofs of selected buildings in Ayazağa campus was

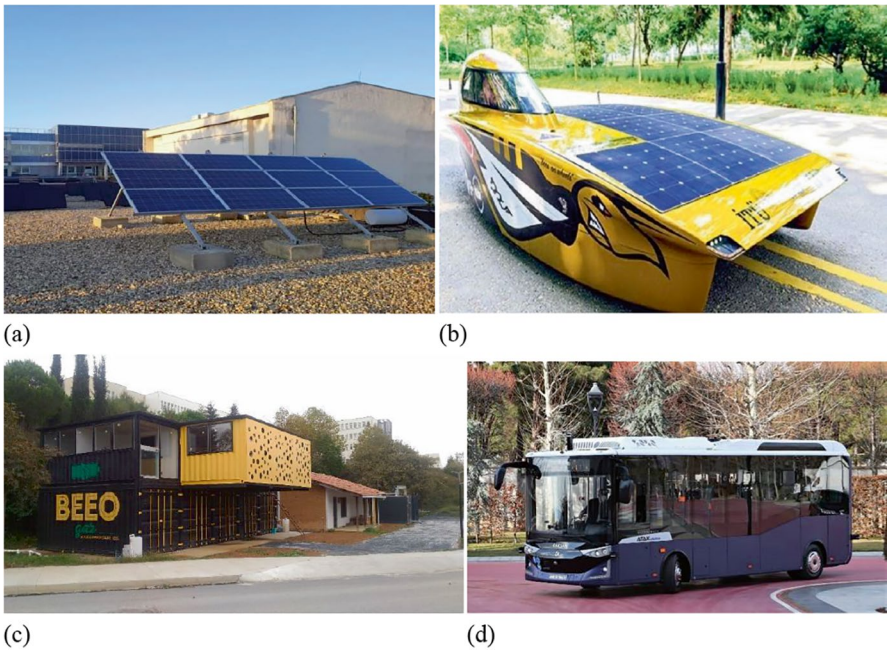


Fig. 5 (**a**) Solar panels (**b**) Solar car (**c**) The Sustainable Energy Production Facility (**d**) Electrical shuttle

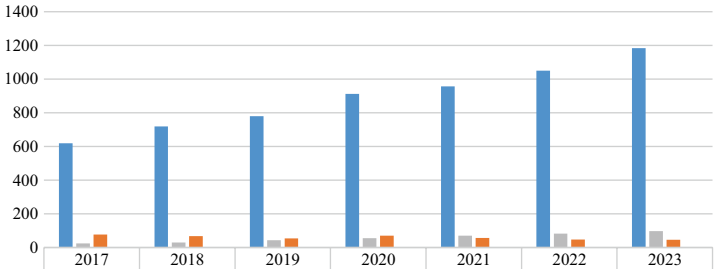
calculated. While there are improvements in Energy and Climate Change (UI GreenMetric 2023) indicators, the capacity of renewable energy resources still limited. The organic waste is separated at source in the dining hall. Separation also takes place in canteens. The Sustainable Energy Production Facility is shown in Fig. 5c.

4 Lessons Learned from UI Green Metrics

Benchmarking was performed by using UI GreenMetric Ranking indicators to understand ITU's sustainability performance after describing how ITU have applied the Green Campus project and Sustainable University activities (UI GreenMetric 2024). ITU's scores were examined by comparing them to the UI GreenMetric Ranking categories and indicators from 2017 to 2023. ITU appeared in the UI GreenMetric rankings for the first time in 2017 and ranked 77th (Acuner et al. 2023) (Fig. 6). There has been a gradual increase in ITU's rank. In 2023, ITU was awarded as the Most Sustainable University in the Middle East and ranked 46th globally.

The UI GreenMetric website provided the data needed to review and compare its performance (UI GreenMetric 2024). Total score notably increases (5860 to 7800) between 2017 to 2020. Overall, the education category scores increased every year since 2017 (Fig. 7). Transportation score was increased due to encourage public transportation and pedestrian priority system. The UI GreenMetric methodology change caused a decrease in the total score for the Setting and Infrastructure category in 2019.

There have been some increases in total score (7800 to 8635), Setting and Infrastructure (1050 to 1275), and Energy and Climate (1225 to 1585) categories between 2020 to 2023. However, ITU has not reached the desired levels in the "Energy and Climate" category (Fig. 8). Furthermore, the performance of ITU in the Waste category remains steady. Since ITU has reached a certain value in terms



	2017	2018	2019	2020	2021	2022	2023
# of universities in World	619	719	780	912	956	1050	1183
# of universities in Turkiye	24	30	43	56	71	83	98
ITU World Ranking	77	67	54	71	57	47	46
ITU National Ranking	1	1	1	1	1	1	1

Fig. 6 UI Green Metric—ITU's World and National Ranking between 2017–2023

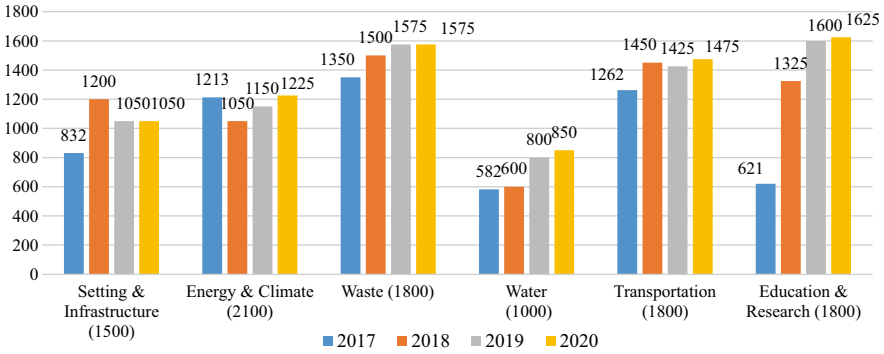


Fig. 7 UI Green Metric Scores of ITU-Before 2020

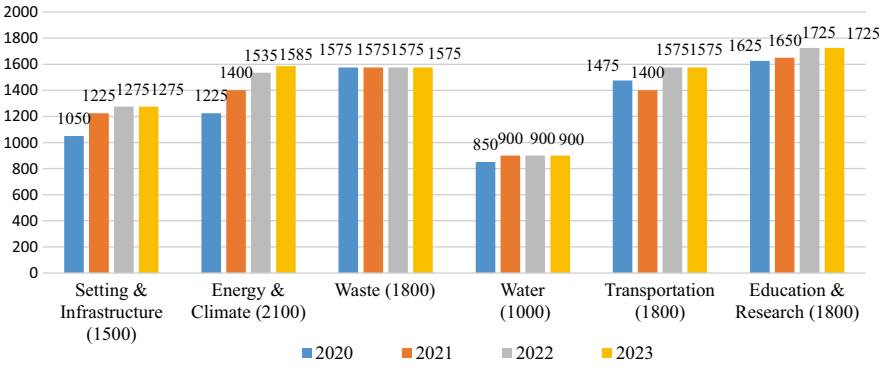


Fig. 8 UI Green Metric Scores of ITU-After 2020

of sustainability, its score increases relatively less between 2020 and 2023. Maintaining place in the world ranking is important as the number of universities applying increases every year, but the scores of the main categories must improve.

5 Actions Required to Ensure a Sustainable and Climate-Friendly Campus

The UN's creation of the SDGs has confirmed the global consensus that we need to transform our socio-economic systems to sustainable modes of operation within environmental limits. However, the implementation of the SDGs has been hampered by several factors, including pandemics, wars, inflation and climate change (Leal Filho et al. 2023). There are measures that can be taken to prevent this situation, such as **budget allocation** that is well-supplied for SDGs, promoting good practice, motivating collaborations between government, civil society, and the private sector, investing in educational quality, implementing successful examples and

ensuring accurate and timely reporting on progress towards the SDGs through strengthening data and monitoring systems (Leal Filho et al. 2023).

In addition, universities face many challenges when it comes to fully **embracing sustainability,** such as limited financial, human, and technological resources (Dziubaniuk et al. 2022). Furthermore, sustainability reporting is limited because of the absence of mandatory regulations (Dziubaniuk et al. 2022). **Legislation** is therefore necessary to create a framework that covers all the building blocks of sustainability (environment, social, and governance). Furthermore, it is important to first create a governance structure, such as the structuring of the **SO** within universities, and to ensure that this structure is inclusive of university residents. Because the 'sustainable university' phase is not a one-time event where all efforts end, rather it is an aspirational state that is constantly evolving (Kapitulčinová et al. 2018).

Increasing the number of studies focused on **social impact** is essential. The significance of campuses responding to disabled staff and students becomes clear when looking at their numbers. To enhance the social dimension, it would be advantageous to receive feedback before and after the work that has been done or will be done and to conduct a study on the 'University Sustainability Index'. It is important for sustainability to be prominently displayed and actively promoted in the daily life of the university. The university staff should see positive examples of sustainable development on campus beyond **recycling** (Dziubaniuk et al. 2022). Effective monitoring, reporting, and communication of performance to key stakeholders is crucial. The **Plan-Do-Check-Act (PDCA)** cycle could be used to reach sustainability targets that rely on the personal waste management among students and staff of HEIs. Besides, increased training of experts in this field can lead to widespread impact through the Sustainability Master's program.

Energy efficiency studies include multifaceted studies that require public institutions and various sectors and disciplines to work together. ITU Energy Efficiency Action Plan includes the studies planned to be carried out in line with the strategic goals of the university in order to reduce energy use and carbon emissions within the borders of ITU campuses, to protect the environment by utilizing renewable energy sources, and to provide energy safely. However, energy efficiency studies in buildings require different expertise depending on the functions of the buildings. It is important to compile the studies carried out by the Ministry of Environment, Urbanization and Climate Change and the Ministry of Energy and Natural Resources regarding the development of financing mechanisms and evaluate them together with all stakeholders (public, finance sector, insurance sector, private sector) and to increase the alternatives and disseminate exemplary practices in universities.

The Build-Operate-Transfer model is currently being utilized by many state universities to implement solar power plants. As an alternative to the Build-Operate-Transfer model, space can be allocated to private organizations associated with the university by leasing for Solar Power Plant, and the company can then produce electricity up to twice the power capacity of the organization by obtaining an electricity production and distribution license. In this case, the revenues generated by the company can be used for sustainability purposes. In this way, when financing projects that will increase energy efficiency, low-cost and recently popular

financing instruments such as green bonds, which are frequently used for areas such as renewable energy and climate change, can be used instead of high-cost bank loans. The World Bank Group's International Finance Corporation (IFC), which supports private investments in sustainability issues, may be an alternative option for financial support.

Universities are creating a hub for students and other stakeholders to experience sustainability, which involves the merging of practice and theory and the integration of sustainability principles into everyday life. However, sustainable development strategies and action plans in universities are useless unless they are accompanied by concrete actions in teaching, research, and outreach activities. **Outreach** activities help these strategies by increasing interaction with internal and external actors and stakeholders. ITU has a strong focus on educational outreach and community engagement. ITU's objective of promoting sustainability and making education accessible to all is aligned with these initiatives.

The presentation of a single case study has limitations. For instance, making objective assessments during scoring for benchmarking and determining how similar or different ITU is from other universities is not always possible. **Consulting** is necessary for sustainability studies in universities that do not have a strong technical structure. Creating a platform that connects universities would be beneficial in this regard. Hence, creating a common standard for sustainability among universities and allowing for new possibilities for future collaboration is essential (Dziubaniuk et al. 2022). Despite its limitations, this paper provides insights into Green Campus applications and the effectiveness of sustainable university projects, and should therefore be useful to any higher education institution interested in sustainability assessment using UI GreenMetric indicators.

6 Conclusion

Results obtained by evaluating ITU's UI GreenMetric scores can be regarded as a reflection of the geographical, regulatory, and economic frameworks specific to ITU. Other universities and organizations may find this approach useful as a case study for exploring their own transition to a sustainable future. Like other organizations, universities are responsible for minimizing their operational impacts. The interconnected nature of the SDGs allows universities to concentrate their strategic development on specific SDGs depending on their capabilities. It is important for the university's strategy to reflect and promote these goals. Future projects and investments should focus more on energy efficiency, renewable energy and smart building topics as they become more prominent. New projects should meet the energy needs of the campus from renewable energy sources by considering that the main purpose is to reduce energy consumption and carbon footprint. However, the effects of these projects will be understood in the medium and long term, and they will be relatively costly. Consequently, the findings of this study could be beneficial

for the universities that want to enhance their visions and practise a successful sustainability transition for their institutions.

Acknowledgments The authors would like to thank Timothy G. E. Davis and Feriha Kamile Özcan for their contributions.

References

Acuner E, Maçin KE, Özcan FK, Karabulut AE, Köse Mutlu B, Durak Ata L (2023) Üniversitelerde sürdürülebilirlik çalışmaları: ITU örneği [Sustainability studies for universities: the example of Istanbul Technical University]. Çevre İklim ve Sürdürülebilirlik 24(2):111–120. https://dergipark.org.tr/en/pub/itucis/issue/79287/1360139

Alshuwaikhat HM, Abubakar I (2008) An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices. J Clean Prod 16:1777–1785. https://doi.org/10.1016/j.jclepro.2007.12.002

Apaydın Ö (2019) A study on the energy efficiency criteria of green campus with a multi-scale approach: Metu campus". Master of Science, Urban Design in City and Region Planning, December

Bekaroo G, Bokhoree C, Ramsamy P, Moedeen W (2019) Investigating personal carbon emissions of employees of higher education institutions: insights from Mauritius. J Clean Prod 209:581–594. https://doi.org/10.1016/j.jclepro.2018.10.238

Dergipark (2024) ITU Journal of Environment, Climate and Sustainability. https://dergipark.org.tr/en/pub/itucis

Dziubaniuk O, Ivanova-Gongne M, Nyholm M, Gugenishvili I, Brännback M (2022) Sustainable development goals in university strategies: making sense of sustainable development in the context of a Finnish University. In: Leal Filho W, Portela de Vasconcelos CR (eds) Handbook of best practices in sustainable development at university level. World Sustainability Series. Springer, Cham. https://doi.org/10.1007/978-3-031-04764-0_1

EELISA (2021) Alliance members. https://eelisa.eu/partners/

Global Reporting Initiative (2016) GRI standards. https://www.globalreporting.org/how-to-use-the-gri-standards/gri-standards-english-language/

IEA (2022) National energy efficiency action plan 2017–2023. https://www.iea.org/policies/7964-national-energy-efficiency-action-plan-2017-2023

ITU (2019) Sustainable landscapes. https://sustainability.itu.edu.tr/sustainable-itu/sustainable-communities-and-landscape/sustainable-landscapes

ITU (2020a) Waste Management Directive. https://sustainability.itu.edu.tr/sustainability-office/policies/itu-waste-management-directive

ITU (2020b) Climate action plan 2021–2048. https://sustainability.itu.edu.tr/sustainability-office/climate-action-plan

ITU (2020c) Gender Equality Plan 2021–2026. https://sustainability.itu.edu.tr/sustainability-office/gender-equality-plan

ITU (2021a) Bicycle and Pedestrian Priority at ITU. https://sustainability.itu.edu.tr/sustainable-itu/healty-life-at-itu

ITU (2021b) Sustainability commissions. https://sustainability.itu.edu.tr/sustainability-office/who-we-are/commissions

ITU (2022a) Biodiversity, Conservation of Ecosystems and Sustainable Use Commission. bioblitz. https://sustainability.itu.edu.tr/sustainable-itu/life-below-water-life-on-land/supporting-land-and-aquatic-ecosystems

ITU (2022b) Sustainability report. https://sustainability.itu.edu.tr/sustainability-office/sustainability-report

ITU (2023a) Zero Waste Club. https://sifiratikkulubu.itu.edu.tr/etkinliklerimiz/projeler/e-atiklariniz-depremzedelere-umut-olsun
ITU (2023b) Promoting conscious water use. https://sustainability.itu.edu.tr/promoting-conscious-water-use
ITU (2023c) ITU Energy Efficiency Action Plan. https://sustainability.itu.edu.tr/sustainable-itu/renewable-energy-in-itu/energy-efficiency-plans-and-potential-in-i-tu
ITU (2024a) Year of sustainability. https://haberler.itu.edu.tr/en/newsdetail/2024/01/04/emphasis-on-sustainability-in-2023
ITU (2024b) Annual report. https://www.itu.edu.tr/docs/librariesprovider2/duyurular/itu_2023_faaliyet_raporu.pdf?sfvrsn=a0aa5c06_2
ITU (2024c) Sustainability courses. https://sustainability.itu.edu.tr/get-involved/education/courses
Kapitulčinová D, AtKisson A, Perdue J, Will M (2018) Towards integrated sustainability in higher education—mapping the use of the accelerator toolset in all dimensions of university practice. J Clean Prod 172:4367–4382. https://doi.org/10.1016/j.jclepro.2017.05.050
Leal Filho W, Viera Trevisan L, Simon Rampasso I, Anholon R, Pimenta Dinis MA, Londero Brandli L, Sierra J, Lange Salvia A, Pretorius R, Nicolau M, Paulino Pires Eustachio JH, Mazutti J (2023) When the alarm bells ring: why the UN sustainable development goals may not be achieved by 2030. J Clean Prod 407:137108. https://doi.org/10.1016/j.jclepro.2023.137108
Maçin KE (2021) UI GreenMetric ranking performance analysis of universities in Turkey: suggestions towards becoming green campuses [paper presentation]. In: 7th International Conference on Sustainable Development, October 13-17, 2021
Maçin KE, Arıkan OA, Demir İ (2020) The UI GreenMetric ranking system: analyzing impacts of categories on overall results [paper presentation]. In: 6th International Conference on Sustainable Development, November 04-08, 2020
Official Gazette of the Republic of Turkiye (2007) - No. 5627, Official Journal No. 26510. https://www.resmigazete.gov.tr/eskiler/2007/05/20070502-2.htm
Shea RP, Worsham MO, Chiasson AD, Kelly Kissock J, McCall BJ (2020) A lifecycle cost analysis of transitioning to a fully-electrified, renewably powered, and carbon-neutral campus at the University of Dayton. Sustain Energy Technol Assess 37:100576. https://doi.org/10.1016/j.seta.2019.100576
Suwartha N, Sari RF (2013) Evaluating UI GreenMetric as a tool to support green universities development: assessment of the year 2011 ranking. J Clean Prod 61:46–53. https://doi.org/10.1016/j.jclepro.2013.02.034
UI GreenMetric (2023) Guidelines. https://greenmetric.ui.ac.id/publications/guidelines/2023/english
UI GreenMetric (2024) Archive Rankings. https://greenmetric.ui.ac.id/rankings/archive
United Nations (2015) Sustainable development goals. https://sdgs.un.org/goals
United Nations. (1972). Declaration of the United Nations Conference on the Human Environment. Stockholm, Sweden, 5–16 June 1972. https://sustainabledevelopment.gov.mt/wpcontent/uploads/2021/12/Konferenza-tan-NU-dwar-l-Ambjent-Uman-Stokkolma.pdf
Yuan X, Zuo J, Huisingh D (2013) Green universities in China–what matters? J Clean Prod 61:36–45. https://doi.org/10.1016/j.jclepro.2012.12.030