

7 AFFORDABLE AND
CLEAN ENERGY



AFFORDABLE AND CLEAN ENERGY REPORT 2021



ISTANBUL
GELISIM
UNIVERSITY

ISTANBUL GELISIM UNIVERSITY



SDG 7 Affordable and Clean Energy

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AFFORDABLE AND CLEAN ENERGY

IGU for Ecological, Social and Economic Sustainability





About the Report

The purpose of the Istanbul Gelisim University (IGU) Accessibility and Clean Energy Report is; In line with the goal of a sustainable future, within the scope of the United Nations Sustainability Goals, to create continuity in order to ensure the effective use of energy, to ensure energy efficiency and to minimize the damage to the environment. In this context, IGU continues to work to improve energy performance in all administrative and social campus areas, as well as to create areas that are respectful to nature and the environment, which solve environmental problems, and to ensure the sustainability of these areas.



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Acknowledgements

We would like to thank our university's valuable academics, administrative unit officers and employees, and our internal and external stakeholders who have contributed to the content of the Accessibility and Clean Energy Report with their work and practices.

Istanbul Gelisim University



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Scope of The Report

Within the scope of Istanbul Gelişim University, a closed area of 212,378 m2 in total has been put into use in 8 separate buildings and building blocks to meet the social and educational needs of its internal and external stakeholders.

Evaluation of Energy Use

Analysis Table of Consumed Energy

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
A BLOCK	41987	43294	47652	54788	48251	55793	57832	61196	60034	33579	62307	62014	628727
B BLOCK	14379	15046	18417	20258	11187	11305	9831	13141	9719	11647	13696	14428	163054
C BLOCK	11327	10068	12333	13566	8554	7572	3435	5148	4867	9706	12361	12687	111624
D-E BLOCK	22503	16166	12857	14143	9516	8561	6601	6671	7331	21175	22397	21528	169449
F BLOCK	12036	10043	12348	13582	8553	8995	7356	10657	8436	7997	13063	13737	126803
G BLOCK	33981	32592	37347	41082	30219	26473	21984	23676	25063	33579	39509	40534	386039
TOWER	197835	178273	188060	208866	157273	193344	200473	208627	179665	151104	155058	144320	2162898
													3748594

The data to be used in the plan covers the time interval of 01.01.2022-31.12.2022. This time period is a summary of the amount of energy used in 2022 and will shed light on the areas that need improvement in the University between 01.01.2023 and 31.12.2023. You can find these improvement and development studies later in the report.





Analysis of Consumed Energy

	Electricity (kWh)
October	297570
November	360.696
December	264428
January	292063
February	312611
March	301365
April	331502
May	196571
June	341044
July	367512
August	386124
September	297108

Table 1: Total Energy Use in Kw (2021 Fall/Spring Academic Year)

Carbon Footprint

Purpose;

The purpose of the calculation is to determine the current emission status by calculating the carbon footprint of Istanbul Gelişim University, to see our situation according to historical data and to determine the priorities of the plans to reduce emissions.

Scope;

It is the data of all units of Istanbul Gelisim University and only the primary carbon footprint of the University is calculated. It has been calculated regularly since 2018.

Stages;

For our carbon footprint calculated since 2018; electricity and natural gas data consumed during the year are obtained from the Construction Affairs and Technical Department, and our annual gasoline and diesel consumption is obtained from the Support Services Department. Calculations are made with the collected data. According to the result, new goals are determined and our success situation emerges in achieving the results of our old goals.



Carbon Footprint Calculation Method

The purpose of the calculation is to determine the current emission status by calculating the carbon footprint of Istanbul Gelişim University, to form the basis for the Carbon Management Plan and to produce a solution for reducing emissions. Calculation constraints; It is the data of all units of Istanbul Gelişim University and only the primary carbon footprint of the University is calculated.

The primary carbon footprint was calculated using the IPCC calculation method. Therefore, the carbon footprint of the University resulting from electricity, transportation and heating, which causes carbon emissions, has been calculated. It is easy to calculate since carbon dioxide emissions are related to the combustion of fuel. Many criteria are required to calculate other greenhouse gases. The IPCC calculation method consists of 3 different categories under the name of Tier. Tier 1 approach was used in this study. For this approach;

1. Gasoline, diesel, LPG, natural gas and electricity consumption amounts were obtained from university official records. The IPCC carbon dioxide emission factor of 0.584 tons/mWh, which was specified in the master's study prepared by Toröz (2015: 79), was used to calculate the emission from electricity consumption.
2. The energy content is calculated by multiplying the consumption values of the fuels with the conversion values given in the IPCC manual. Conversion values are the values included in the Communiqué on Monitoring and Reporting of Greenhouse Gas Emissions, published in the Official Gazette dated 22.07.2014 and numbered 29068, and specified in the IPCC 2006 Guidelines. These values are given in the Tables below.

Fuel Type	Net Calorific Value (Tj/Gg)
Gasoline	44,3
Diesel	43
Natural Gas	48

Table 2: Net Calorific Value of Fuels

Energy Consumption (TJ) = Fuel Consumption (t) × Net Calorific Value (TJ/Gg)

3. For each fuel group, the (average value) carbon emission factors determined in the IPCC manual are selected and using this value, the total carbon content in the fuel is calculated.

Carbon Content (t C) = Carbon Emission Factor (t C/TJ) × Energy Consumption (TJ)

Fuel Type	Emission Factor (tC/tJ)
Gasoline	18,9
Diesel	20,2
Natural Gas	15,3

Table 3: Emission Factor of Fuels (Source: TUİK, 2013:16)



4. The amount of carbon that is not oxidized during combustion is found and the carbon value that is fully included in the combustion is calculated.

$$\text{Carbon Emission (Gg C)} = \text{Carbon Content (Gg C)} \times \text{Carbon Oxidation Rate}$$

Fuel Type	Oxidation Rate
Gasoline	0,99
Diesel	0,99
Natural Gas	0,995

Table 4: Oxidation Rates of Fuels

5. At this stage, the ratio of 44/12, which is the ratio of the molecular weight of CO₂ to the molecular weight of carbon, is multiplied by the value found in the previous step, and the CO₂ emission value resulting from the combustion of the fuel is found.

$$\text{CO}_2 \text{ Emission (Gg CO}_2\text{)} = \text{Carbon Emission (Gg C)} \times (44/12)$$

Carbon Footprint Calculation Result

Electricity, gasoline, diesel, LPG, natural gas consumption data for 2021 obtained from the university and calculations with the IPCC methodology Tier 1 approach are shown in Table 5.

Energy Type	Consumption Amount (Year 2021)	Consumption Amount (Ton)	Net Calorie Value (TJ/Gg)	Carbon Emission Factor (t C/TJ)	Carbon Oxidation Rate	Ton CO ₂	Ratio (%)
Gasoline	2.049 L	1,52	44,3	18,9	0,99	4,6	0,19
Diesel	13.905 L	11,74	43	20,2	0,99	37,01	1,57
Natural Gas	59.110 m ³	47,25	48	15,3	0,995	126,6	5,37
Electricity	3.748.594 kWh					2.189,2	92,87
Total						2.357,4	

Table 5: Carbon Footprint Calculation of Istanbul Gelişim University (Year 2021)



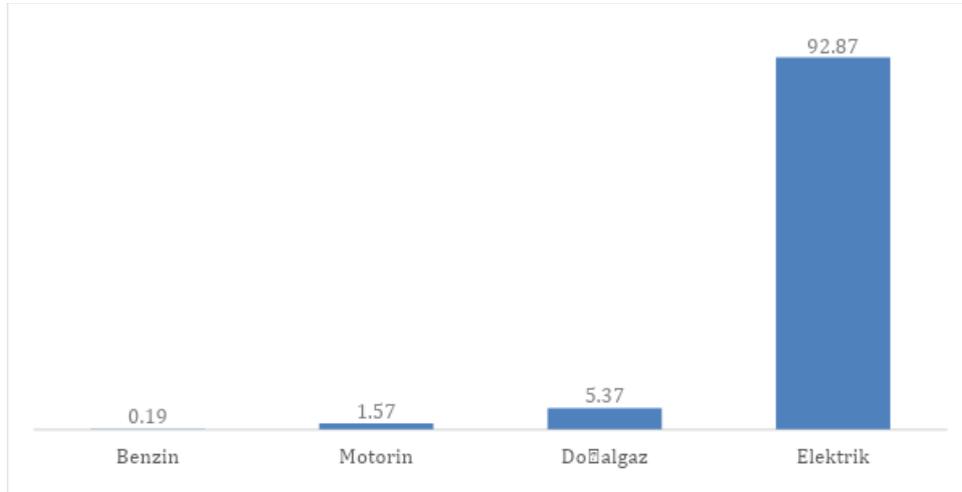


Table 6: ??

Our Carbon Footprint by Years

2018 (Ton CO2)	2019 (Ton CO2)	2020 (Ton CO2)	2021 (Ton CO2)
1.893,711	2.417,315	2.471,315	2.357,4

The reason for the increase seen in 2019; It is the activation of our tower campus that year. In 2019, the Faculty of Economics and Administrative Sciences, the academic staff and classrooms of the School of Physical Education and Sports were moved to our Kule campus by increasing the number of classrooms. Therefore, this increase is natural. When we look at our last calculation, we see a 5% decrease compared to 2020. Despite the increase in our actively used area in this process, we see a decrease as a result of our plans. The continuity of these efforts should be ensured.





Research

1- Assist. prof. Hakan Aydın's article titled "**Evaluation of Energy Systems Security in the Scope of Cyber Security**", which he worked with Ali Çetinkaya, MSc Engineer from IGU Technology and Transfer Office, and Mehmet Ali Barışkan, Computer Engineering Research Assistant, was published in the journal "Security Sciences".

Güvenlik Bilimleri Dergisi, Mayıs 2021, Cilt:10 Sayı:1, 151-174 DOI:10.28956/gbd.941801

SİBER GÜVENLİK KAPSAMINDA ENERJİ SİSTEMLERİ GÜVENLİĞİNİN DEĞERLENDİRİLMESİ

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Öz

Günümüzde enerji sistemlerinde Bilgi ve İletişim Teknolojilerine (BİT) ve özellikle de İnternete olan artan oranlardaki bağımlılık, bu sistemlerde siber güvenliğin sağlanmasını zorunlu hale getirmiştir. Enerji sistemlerinde kullanılan bilişim teknolojilerinde meydana gelebilecek siber güvenlik olayları; enerji hizmetlerinin durmasına, aksamasına, büyük ölçekte ekonomik zarar görülmesine, kamu düzeninin bozulmasına, can kaybı yaşanmasına ve hatta ülkelerin ulusal güvenliğinin tehlikeye düşmesine neden olma risklerini içermektedir. Bu araştırmanın amacı; enerji sistemlerinde siber güvenlik kavramlarının genel çerçevesini çizmek, enerji sistemlerine yönelik yaşanan siber saldırıları araştırmak, bu çerçevede SCADA ile yönetilen kritik altyapılarda, özellikle de enerji sistemleri altyapılarında, siber güvenliğin önemini ortaya koymak ve bu konuya ilişkin mevcut farkındalığın artırılmasına yönelik öneriler getirmek olarak belirlenmiştir. Araştırmada betimleme yöntemi kullanılmıştır. Araştırmada elde edilen bilgiler, enerji sistemlerinde siber güvenliğin sağlanmasının hayati derecede öneme sahip olduğu yönündedir. Çalışmada getirilen öneriler arasında, özellikle Türkiye’de enerji sektöründe ulusal siber güvenlik testlerinden geçirilmiş ve ulusal sertifikasyona sahip akredite yerli güvenlik danışman şirketleri tarafından tasarlanmış ve test edilmiş milli siber güvenlik bilgi teknolojileri ve ürünleri kullanılması hususuna özellikle vurgu yapılmıştır.

Anahtar Kelimeler: Enerji Sistemleri, Siber Güvenlik, SCADA Sistemleri, Kritik Altyapılar.



2- Istanbul Gelisim University Computer Engineering Department Head of Department and Lecturer İbrahim Erol's article titled "Evaluation of LEED Certified Office Buildings in terms of Energy and Atmosphere Criteria: The Example of Maslak Region", written with Assist. Prof. Gözde Çakır Kıasf, was published in Bilecik Şeyh Edebali University Journal of Science.





Araştırma Makalesi - Research Article

LEED Sertifikalı Ofis Binalarının Enerji ve Atmosfer Kriteri Açısından Değerlendirilmesi: Maslak Bölgesi Örneği

Evaluation of LEED Certified Office Buildings in Terms of Energy and Atmosphere Criteria: The Case of Maslak Region

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Reviz / Revised: 21/04/2021

Kabul / Accepted: 26/04/2021



Master's Thesis

Departments	Thesis Name	SDG
Electrical and Electronics Engineering	Transformatörlerin Güneş Enerjisi Destekli Kurutulması	7 AFFORDABLE AND CLEAN ENERGY
Electrical and Electronics Engineering (English)	Improvement of cluster head selection in leach protocol to reducing energy consumption in wireless sensor networks	7 AFFORDABLE AND CLEAN ENERGY, 8 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Political Science and International Relations	Ortak Enerji Politikaları Doğrultusunda Türkiye-Azerbaycan İlişkileri	7 AFFORDABLE AND CLEAN ENERGY, 17 PARTNERSHIPS FOR THE GOALS
	Hindistan'ın Orta Asya Enerji Politikası ve Afganistan'ın Güvenliğine Etkileri	7 AFFORDABLE AND CLEAN ENERGY, 17 PARTNERSHIPS FOR THE GOALS



Community Service Work

1-A project cooperation meeting was held between Istanbul Metropolitan Municipality (IBB) and Istanbul Gelisim University (IGU). It was decided that the topics of the projects to be realized together would be energy saving, water saving, children's playgrounds, encouragement of youth to sports, irrigation systems, homeless and disabled people.



Operations

Plans to Improve Energy Efficiency and Reduce Carbon Emissions

Our Plans and Implementations to Increase the Efficiency of the Evaluated Energy and to Reduce the Carbon Emissions

As Istanbul Gelisim University, one of our priorities is to reduce energy savings and carbon emissions that harm the environment. Our use of automation and LED lighting serves our purpose indirectly by reducing energy consumption. In addition, IGU organizes training to raise awareness of its students and staff on carbon emissions. In order to reduce the carbon footprint, studies are carried out to save water, electricity, heating and transportation, and environmentally friendly, energy-saving, low-carbon emission devices are preferred for the products supplied during the purchasing processes.





Projects for the reuse of rain water and gray water are produced and studies are carried out for the purpose of saving and awareness. One of these rainwater works was carried out in our campus of the Faculty of Fine arts. By applying exterior sheathing to our buildings, heating losses have been prevented and our natural gas consumption has decreased. In addition, the engine oil, engine filter, air filter and oil filter are changed every 6 months in order to reduce the carbon emission by reducing the fuel consumption of the generators. Apart from this maintenance, regular checks are made every month. With these maintenance, we also reduce the fuel to be spent during the interruption, thus reducing the carbon emissions.



Studies carried out in this context are listed below:

1- The fluorescent lamps used in our campuses are being reduced from year to year. These fluorescent lamps are being replaced with longer lasting and less energy consuming LED lightings. This study will enable us to get a higher illumination level with less cost with the decrease in the number besides consumption, that is, it will increase the efficiency. In line with this plan, 389 new LED lightings were changed in our areas opened in 2021, and 636 fluorescent-LED lightings were replaced in our areas in use, and a total of 1025 LED lighting was used, and our LED lighting rate, which was 40.5%, was improved to 45%.

	Total Lighting	Led Lighting	Led Lighting Ratio
2018	17337	5548	32%
2019	18153	6669	36,7%
2020	19153	7769	40,5%
2021	19542	8794	45%



2- Pursuant to the "Energy Efficiency Law" numbered 5627, which was published in the Official Gazette dated May 2, 2007 and numbered 26510, and "Regulation on Increasing Efficiency in the Use of Energy Resources and Energy", dated October 25, 2008 and numbered 27035; It is obligatory to appoint an energy manager in commercial buildings with a total construction area of at least 20,000 m2 or annual energy consumption of 500 TOE, and in public buildings with a total construction area of at least 10,000 m2 or with a total annual energy consumption of 250 TOE or more. After effective planning and negotiations, it was agreed with an authorized institution for our Tower campus, which met these conditions. As an example of the studies carried out in line with the prepared report; Cascade system is preferred and installed in boiler systems. The aim of the report is to increase energy efficiency and to consume less energy and natural gas.



3- The importance of renewable energy sources for a sustainable life is increasing day by day. The university administration has taken a decision for the use of renewable energy systems by acting with environmental awareness. As one of these studies; The work on converting environmental lighting to solar LED projectors has been initiated. With this study, energy consumption has been reduced. In 2021, 30 solar environmental lightings were installed in our Rectorate building, resulting in a reduction of 3000 Wh in consumption. Plans have been made for the use of the tested system in other campuses, and work will begin.





4- As a result of the decision taken in line with the increase in the use of renewable energy (wind and solar energy); The companies that supply the electricity produced from renewable energy sources in a respectful way were searched and a supplier who can certify this was agreed with (YEK-G certificate). Thanks to this study, all of the electricity consumed in our university was provided from renewable energy.



5- Our university, which is on the way to become a university that produces its own needs; started to work to establish a Solar Energy System for electricity generation. Two different studies are carried out. The first of these; It is to produce 800 kWh of electricity by installing the GES on the roof of the tower campus. The electricity produced will meet 47% of the needs of our Tower campus. The second is; It is the establishment of a 4000 kWh system. Negotiations with companies continue.



6- It is planned to make heating/cooling systems controllable with DDC systems. DDC systems have started to be used in all of your new structures. About 40% savings were achieved compared to the traditional system.



7- Before the improvement was made, there were many electric heaters in the offices other than the central heating, and serious electricity consumption was emerging. By ensuring the efficient use of heating systems, the use of heaters has been reduced by 90%. The continuation of the work carried out with the same stability is coming.



8- In the procurement processes of new devices to be used in the campuses, the purchasing specifications have been updated, with energy saving being the primary selection criteria. In this context, equipment, devices and tools are procured from environmentally friendly manufacturers and vendors throughout the university.





9- Compensation panels used to prevent losses affecting total energy consumption were maintained. It is followed regularly.



10- Studies are planned to reduce the use of room type air conditioners used in the closed areas of the campuses. The planned works have been implemented. After the heating systems works, the number of 300 air conditioners used decreased to 270, resulting in a 10% reduction. This recovery rate is ensured to be increased regularly.



11- The use of various tea, coffee makers and similar electrical appliances in personnel offices increases energy use. In order to reduce energy use, it is planned to create common kitchen areas in the campuses. In this direction, 2 areas have been established in blocks F and G. Our goal for the new year is 5 areas.





12- All personnel are trained on energy efficiency within the framework of a certain periodical calendar throughout the year.



13- It is planned to take measures to increase awareness about the use of warning signs and posters and reduce consumption.



14- IGU Environmental Policy has been accepted by the senior management. In accordance with this policy, it has been decided to establish Environmental Teams, to provide environmental management training to the personnel, to create a waste collection area, and to carry out activities for the separation of wastes at their source. Studies have started to identify, monitor and measure the important environmental aspects of the University.





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THE GLOBAL GOALS

For Sustainable Development



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