

7 AFFORDABLE AND  
CLEAN ENERGY



# AFFORDABLE AND CLEAN ENERGY REPORT 2023



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## About the Report

The purpose of the Istanbul Gelisim University (IGU) Accessibility and Clean Energy Report is to create continuity to ensure the effective use of energy within the scope of the United Nations Sustainable Development Goals (SDGs), to ensure energy efficiency and to minimise damage to the environment.

In this context, IGU continues to work to improve energy performance in all administrative and social campus areas, to create areas that respect nature and the environment, to solve environmental problems and to ensure the sustainability of these areas.



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## Acknowledgements

We would like to thank IGU's valuable academicians, administrative unit managers, employees, dear students, graduates, internal and external stakeholders who contributed to the creation of the report.

We would also like to thank all members of the university, university stakeholders who have embraced all the existing goals related to sustainability in the content of the report and have carried out studies in this direction, and the university Board of Trustees and the Rectorate for providing endless support for these studies.

**Istanbul Gelişim University**



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## ACCESSIBLE AND CLEAN ENERGY REPORT

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**1. Scientific Researches**

**1.1. IGU Scopus Publications on Accessible and Clean Energy**

The number of publications on energy and energy efficiency about accessible and clean energy in 2023 is **56**. The number of views is as shown in the table below. This data was written on 03.06.2024. The total number of views of the publications below is **1502** and the total number of citations is **775**. It is expected that the number of citations and views will increase as of this date.

**Table 1.** Scopus Publications, Citation and Views

	Publication Name	Citation Count	View Count	Publication Link	SDG
1.	Role of green technology, environmental taxes, and green energy towards sustainable environment: Insights from sovereign Nordic countries by CS-ARDL approach	3	55	<a href="#">Scopus Link</a>	
2.	Demystifying the links between green technology innovation, economic growth, and environmental tax in ASEAN-6 countries: The dynamic role of green energy and green investment	3	61	<a href="#">Scopus Link</a>	
3.	Spatiotemporal influencing factors of energy efficiency in 43 european countries: A spatial econometric analysis	4	43	<a href="#">Scopus Link</a>	
4.	Another look at the nexus between economic growth trajectory and emission within the context of developing country: fresh insights from a nonparametric causality-in-quantiles test	10	69	<a href="#">Scopus Link</a>	
5.	The role of solar energy usage in environmental sustainability: Fresh evidence through time-frequency analyses	10	38	<a href="#">Scopus Link</a>	
6.	Modeling Energy, Education, Trade, and Tourism-Induced Environmental Kuznets Curve (EKC) Hypothesis: Evidence from the Middle East	13	9	<a href="#">Scopus Link</a>	
7.	Technological pathways to decarbonisation and the role of renewable energy: A study of European countries using consumption-based metrics	1	20	<a href="#">Scopus Link</a>	
8.	Glasgow climate change conference (COP26) and its implications in sub-Sahara Africa economies	10	26	<a href="#">Scopus Link</a>	
9.	Econometrics analysis on cement production and environmental quality in European Union countries	12	47	<a href="#">Scopus Link</a>	
10.	Transitioning to clean energy: Assessing the impact of renewable energy, bio-capacity and access to clean fuel on carbon emissions in OECD economies	2	26	<a href="#">Scopus Link</a>	
11.	Environmental sustainability in Asian countries: Understanding the criticality of economic growth, industrialization, tourism import, and energy use	22	49	<a href="#">Scopus Link</a>	
12.	Environmental sustainability amidst financial inclusion in five fragile economies: Evidence from lens of environmental Kuznets curve	2	62	<a href="#">Scopus Link</a>	
13.	New Insights into the Research Landscape on the Application of Artificial Intelligence in Sustainable Smart Cities: A Bibliometric Mapping and Network Analysis Approach	17	70	<a href="#">Scopus Link</a>	
14.	Sustainable development policies of renewable energy and technological innovation toward climate and sustainable development goals	2	30	<a href="#">Scopus Link</a>	





	Publication Name	Citation Count	View Count	Publication Link	SDG
15.	Impact of financial development, trade flows, and institution on environmental sustainability in emerging markets	22	17	<a href="#">Scopus Link</a>	
16.	Does financialization enhance renewable energy development in Sub-Saharan African countries?	2	28	<a href="#">Scopus Link</a>	
17.	Development of a Hybrid Support Vector Machine with Grey Wolf Optimization Algorithm for Detection of the Solar Power Plants Anomalies	42	13	<a href="#">Scopus Link</a>	
18.	Boosting Energy Efficiency in Turkey: The Role of Public-Private Partnership Investment	13	36	<a href="#">Scopus Link</a>	
19.	Mediating role of finance amidst resource and energy policies in carbon control: A sustainable development study of Saudi Arabia	1	17	<a href="#">Scopus Link</a>	
20.	Machine Learning Applications in Renewable Energy (MLARE) Research: A Publication Trend and Bibliometric Analysis Study (2012-2021)	27	29	<a href="#">Scopus Link</a>	
21.	Sustainable electricity consumption in South Africa: the impacts of tourism and economic growth	17	24	<a href="#">Scopus Link</a>	
22.	An empirical assessment of the tripartite nexus between environmental pollution, economic growth, and agricultural production in Sub-Saharan African countries	17	23	<a href="#">Scopus Link</a>	
23.	Revisiting the pollution haven hypothesis within the context of the environmental Kuznets curve	29	54	<a href="#">Scopus Link</a>	
24.	The nexus of disaggregated energy sources and cement production carbon emission in China	22	22	<a href="#">Scopus Link</a>	
25.	The synergistic roles of green openness and economic complexity in environmental sustainability of Europe's largest economy: Implications for technology-intensive and environmentally friendly products	5	30	<a href="#">Scopus Link</a>	
26.	Synthesizing the role of technological innovation on sustainable development and climate action: Does governance play a role in sub-Saharan Africa?	7	35	<a href="#">Scopus Link</a>	
27.	Dam failure analysis and flood disaster simulation under various scenarios	39	28	<a href="#">Scopus Link</a>	
28.	Another outlook into energy-growth nexus in Mexico for sustainable development: Accounting for the combined impact of urbanization and trade openness	33	16	<a href="#">Scopus Link</a>	
29.	Testing the Mediating Role of Fiscal Policy in the Environmental Degradation in Portugal: Evidence from Multiple Structural Breaks Co-integration Test	26	12	<a href="#">Scopus Link</a>	
30.	Investigation of the effect of carbon nanotube addition to diesel-biodiesel blend on engine performance and exhaust emissions	27	20	<a href="#">Scopus Link</a>	
31.	Rolling horizon optimization based real-time energy management of a residential neighborhood considering PV and ESS usage fairness	1	26	<a href="#">Scopus Link</a>	
32.	Enhancing UAV communication links with Reconfigurable intelligent surfaces	18	4	<a href="#">Scopus Link</a>	
33.	Environmental implication of energy policies and private and public subsidies on infant mortality rate: a sustainable development study of India	17	21	<a href="#">Scopus Link</a>	
34.	Does geopolitics trigger energy inflation in the European economic area? Evidence from a panel time-varying regression	29	11	<a href="#">Scopus Link</a>	
35.	How effective is financial development in renewable energy investments? Empirical evidence from E-7 countries	0	11	<a href="#">Scopus Link</a>	















Publication Name	Citation Count	View Count	Publication Link	SDG
36. Global Energy Transformation and the Impacts of Systematic Energy Change Policy on Climate Change Mitigation	13	12	<a href="#">Scopus Link</a>	
37. An integrated picture fuzzy Z-AHP & TOPSIS methodology: Application to solar panel selection	7	35	<a href="#">Scopus Link</a>	
38. Comfort violation minimization oriented energy management strategy for a renewable-assisted stand-alone multi-energy electric vehicle service station	10	46	<a href="#">Scopus Link</a>	
39. A Novel Z-Fuzzy AHP&EDAS Methodology and Its Application to Wind Turbine Selection	6	16	<a href="#">Scopus Link</a>	
40. Cost minimization oriented energy management of PV-assisted refueling and recharging stations for FC-ultracapacitor hybrid trams	3	14	<a href="#">Scopus Link</a>	
41. Human capital and manufacturing activities under environmentally-driven urbanization in the MENA region	46	8	<a href="#">Scopus Link</a>	
42. Bio-Based Jet Fuel Production by Transesterification of Nettle Seeds	0	10	<a href="#">Scopus Link</a>	
43. Does psychological empowerment improve renewable energy technology acceptance and recommendation? Evidence from 17 rural communities	10	49	<a href="#">Scopus Link</a>	
44. On the nexus between real income, renewable energy consumption, and environmental sustainability on life expectancy for BRICS-T countries: Accessing evidence from quantile regression	33	11	<a href="#">Scopus Link</a>	
45. Comprehensive environmental and techno-economic feasibility assessment of biomass- solar on grid hybrid power generation system for Burdur Mehmet Akif Ersoy University Istiklal Campus	14	10	<a href="#">Scopus Link</a>	
46. Asymmetric effect of environmental cost of forest rents in the Guinean forest-savanna mosaic: The Nigerian experience	17	23	<a href="#">Scopus Link</a>	
47. Development of an Energy Management System for Minimizing Hydrogen Consumption in Fuel Cell and Ultracapacitor Hybrid Electric Garbage Trucks and Analysis of the Sizing Impact	0	13	<a href="#">Scopus Link</a>	
48. Uncertainty Dealing Energy Management of a PV and Battery Supplied Grid Connected Charging Service Station for a Fleet of Mobile Charging Oriented EV's	0	15	<a href="#">Scopus Link</a>	
49. Protocols, applications and solutions to support the environment, occupational safety and health in tanneries	0	30	<a href="#">Scopus Link</a>	
50. Microalgae as a Source for Bioenergy: a Search for an Energy-Efficient Process	16	28	<a href="#">Scopus Link</a>	
51. A comprehensive review on valorisation of octal by-product as supplementary admixtures in the production of fired and unfired bricks	3	51	<a href="#">Scopus Link</a>	
52. Evaluating the impact of dam construction on extreme shrinkage of Urmia Lake using spatial data	29	11	<a href="#">Scopus Link</a>	
53. Empirical analysis of South African's urbanization growth and export demands: implications for environmental sustainability	17	14	<a href="#">Scopus Link</a>	
54. Sustainable Development through Carbon Neutrality: A Policy Insight from Foreign Direct Investment and Service Policy	0	4	<a href="#">Scopus Link</a>	
55. Characterization of Proteins Extracted from Ulva sp., Padina sp., and Laurencia sp. Macroalgae Using Green Technology: Effect of In Vitro Digestion on Antioxidant and ACE-I Inhibitory Activity	28	10	<a href="#">Scopus Link</a>	
56. Design of sustainable campus modal in Istanbul Gelisim University using fuzzy multicriteria decision making methods	18	10	<a href="#">Scopus Link</a>	



## 1.2. IGU Scientific Publications on Accessible and Clean Energy

The number of scientific publications on accessible and clean energy, energy and energy efficiency in 2023 is 10. Accessible and Clean Energy publications published in 2023 are listed in the table below.

**Table 2.** Scientific Publications on Accessible and Clean Energy

Yayın Başlığı	Publication Link	SDG
Testing Linear and Nonlinear Relationships Between Foreign Direct Investment and Fossil Energy Consumption in Fragile Five Countries	<a href="#">Article Link</a>	
An Investigation into the Role of Tourism Growth, Conventional Energy Consumption and Real Income on Ecological Footprint Nexus in France	<a href="#">Article Link</a>	
Endüstriyel Şirketlerin Enerji İhtiyaçlarına Yönelik Yenilenebilir Enerji Kaynak Dönüşümü Analizi ve Tasarımı	<a href="#">Proceedings Link</a>	
Thermophotovoltaic System Setup and Analysis with Using Gallium Antimonide (GaSb) Cell in High Temperature	<a href="#">Book Chapter Link</a>	
Relationship Between Green Future and Well-Being Indices: Canonical Correlation Analysis	<a href="#">Proceedings Link</a>	
Sterling insights into natural resources intensification, ageing population and globalization on environmental status in Mediterranean countries	<a href="#">Article Link</a>	
Sürdürülebilir Havayollarının Tüketici Tarafından Kabulünü Etkileyen Teşvik Edici Faktörler	<a href="#">Proceedings Link</a>	
Cushioning environmental damage with institutions and FDI: study of sustainable development goals (SDGs)	<a href="#">Article Link</a>	
Developing environmental policy framework for sustainable development in Next-11 countries: the impacts of information and communication technology and urbanization on the ecological footprint	<a href="#">Article Link</a>	
Economic and environmental implications of resource rent: A dual analysis of Venezuela's sustainability	<a href="#">Article Link</a>	





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### 1.3. IGU Lessons Given on Accessible and Clean Energy

In the 2023-2024 academic year, within the scope of Accessible and Clean Energy at IGU, specialized in the field of sustainability; **New and Renewable Energy Systems** in the departments of [Mechatronics Engineering \(MA\)](#), [Electrical and Electronics Engineering \(MA\)](#) at the graduate level, **Renewable Energy Systems** in the department of [Electrical and Electronics Engineering in the Faculty of Engineering and Architecture](#) at the undergraduate level and **Renewable Energy Sources** in the department of [Automotive Technology in the IGU Vocational School](#) at the associate degree level are included in the curriculum.

### 2. Policies towards Renewable Energy

A fundamental value and goal within the scope of IGU's "[Sustainability Training Policy](#)" is "Supporting industries within the scope of sustainable infrastructure, sustainable technology and energy efficiency". Within the scope of this goal, IGU designs interactive and student-centered sustainability education programs to support industries to realize sustainable infrastructure transformation within responsible production, reduce their ecological footprint by developing sustainable energy and waste policies and provide social benefits to society by designing corporate responsibility projects in alignment with the goals.

IGU, through its "[Policy on IGU Carbon Emission and Protection of Nature](#)", sets the basic principle of raising awareness of the society and ensuring transformation within itself in order to protect nature and ensure the sustainability of the environment. IGU acts with the aim of obtaining its own energy needs from these sources through initiatives towards renewable energy sources and supports projects that will raise awareness and contribute to society at this point.

IGU has a "[Environment Policy](#)" and cooperates with the local industry to reduce and prevent waste, make investments to improve environmental performance, and carry out activities to reduce its environmental footprint.

Under the "[Sustainable Procurement and Supplier Policy](#)", IGU ensures the procurement of environmentally friendly goods and services through multifaceted, effective and sustainable supplier cooperation.

IGU, under its "[Policy of Sustainability Research](#)", focuses on the concept of sustainability, especially in the social, economic and environmental context, and encourages its researchers to design and conduct their research in this context. Furthermore, IGU supports its researchers to establish local and international collaborations.

IGU, under the "[Policy for Waste Management and Reducing Environmentally Hazardous Products](#)", aims to reduce waste generation and the use of natural resources through reuse, recycling and recovery methods of waste management. When necessary, it carries out the removal of wastes and environmentally harmful products in cooperation with the local industry. In this context, there are "Medical Waste Contract", "Non-Hazardous Waste Contract", "Dental Hospital Medical Waste Contract" with the local industry.



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IGU, under the “[Water Management Policy](#)”, regularly takes responsibility for conducting studies, programs and projects on issues such as economic analysis of water use and raising awareness on water issues, and supports these activities. In this context, cooperation is being realized with all local and global stakeholders.

### 3. Measurements

#### 3.1. Analysis of Consumed Energy

The consumption values of electricity energy, which is the type that provides the most energy among the energy types used at the University, are analyzed in the table below by month and university buildings. The total electricity consumption of the university was calculated as **3.901.005,16 kWh**. When electrical energy consumption is evaluated according to the university buildings, the buildings where the most energy consumed were seen at Block A and Block K. Block A is the building used as the Rectorate building and where most of the administrative work is carried out. Block K (tower), on the other hand, contains many application laboratories and activity areas, it especially contains the faculties of Engineering, Architecture and Applied Sciences. Block K also has the highest number of floors and area of use. Therefore, it is normal that energy use in these buildings is higher than in other buildings.

**Table 3:** Distribution of Electricity Energy Consumption (kWh) by Buildings and Months in 2023

Months	A Block	B Block	C Block	D-E Block	F Block	G Block	K Block	Total
January		10.715,65	16.380,21	12.815,52	12.543,90	35.894,85	226.690,88	<b>315.041,01</b>
February		6.172,78	15.088,12	8.631,42	9.122,30	22.803,12	175.665,38	<b>237.483,12</b>
March	216.984,65	7.943,80	18.833,60	7.661,10	10.033,60	17.954,15	134.844,98	<b>414.255,88</b>
April	55.105,47	7.623,33	13.892,23	7.972,74	7.582,80	29.278,08	168.187,50	<b>289.642,15</b>
May	53.356,32	7.637,15	12.150,08	7.210,32	8.494,90	28.778,18	170.148,83	<b>287.775,78</b>
June	46.592,60	4.386,30	8.696,96	6.679,20	6.994,40	21.633,57	130.166,78	<b>225.149,81</b>
July	73.406,34	4.887,00	13.388,24	6.671,04	8.810,30	23.138,46	272.769,08	<b>403.070,46</b>
August	76.662,45	4.952,10	14.195,92	7.250,28	8.920,50	26.491,86	197.612,55	<b>336.085,66</b>
September	58.695,89	4.472,72	10.772,16	6.708,30	7.822,20	22.851,77	131.191,43	<b>242.514,47</b>
October	54.496,89		13.464,92	10.489,62	9.639,70	37.314,86	214.881,53	<b>340.287,52</b>
November	64.463,94	22.732,93	15.064,28	11.098,26	10.303,20	39.720,20	245.175,98	<b>408.558,79</b>
December	73.570,91	12.443,93	17.228,92	12.557,94	13.358,40	40.461,26	231.519,15	<b>401.140,51</b>
<b>Total</b>	<b>773.335,46</b>	<b>93.967,69</b>	<b>169.155,64</b>	<b>105.745,74</b>	<b>113.626,20</b>	<b>346.320,36</b>	<b>2.298.854,07</b>	<b>3.901.005,16</b>

\* The values are given in kWh.



The analysis of natural gas consumption amounts used at the University by month is shown in the table. In 2023, when the distribution of natural gas consumption is observed, it is seen that the majority of the use is in the winter months. This is an expected result since it is used for heating purposes. No natural gas-based energy was used during the warm season months. The total amount of natural gas consumption is **123,936 m<sup>3</sup>**.

**Table 4:** Analysis of Total Natural Gas Energy Consumed in 2023 in m<sup>3</sup>

Months	Natural Gas Consumption Amount (m3)
January	21.326
February	18.963
March	9.259
April	8.753
May	13.316
June	1.507
July	28
August	28
September	30
October	544
November	9.649
December	40.533
<b>Total</b>	<b>123.936</b>

\*Values are given in m<sup>3</sup>.



The amount of energy consumed for all energy types used by the university in 2023 is shown in table 5. Accordingly, the total amount of gasoline consumption was determined as **10,600.32 L**, diesel as **24,692.56 L**, natural gas as **123,936 m<sup>3</sup>** and electricity as **3,901,005.16 kWh**. The amount of energy consumed for energy types in 2023 is shown in the table below

**Table 5:** Energy Consumption by Energy Types in 2023

Energy Type	Consumption Amount	Unit
Gasoline	10.600,32	Litre
Diesel	24.692,56	Litre
Natural Gas	123.936,00	m3
Electricity	3.901.005,16	kWh

### 3.2. Evaluation of Consumed Energy

When we look at the consumption amounts of the energy sources used at the university in 2023, calculations based on Gigajoule (Gj) energy type has seen that a large part of the university's energy expenditure is composed entirely of electrical energy obtained from renewable energy sources (Figure 1). A target has been set to further reduce the share of gasoline, diesel and natural gas dependent energy consumption in the coming years.

The values in Figure 1 are expressed in Gj.



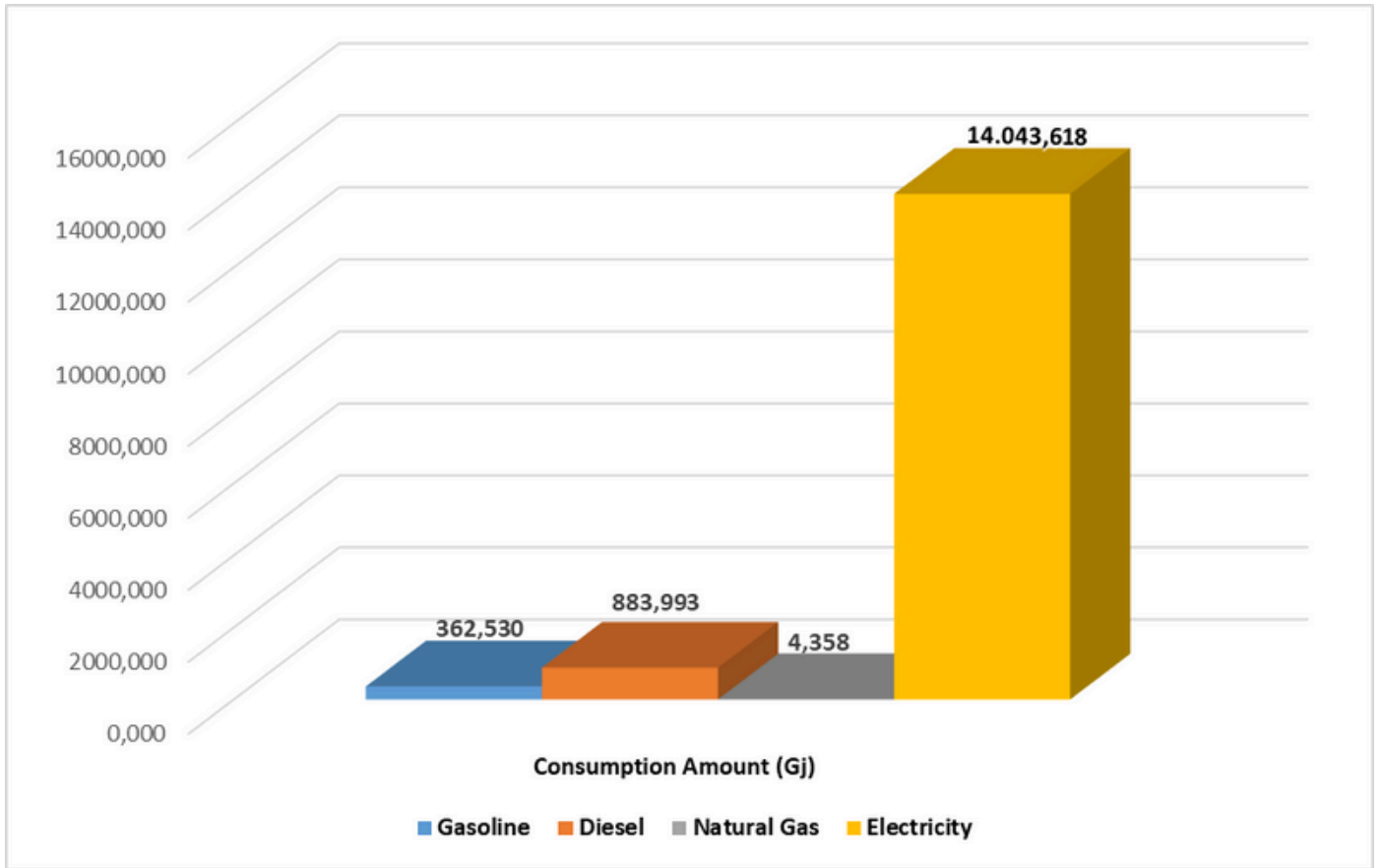


Figure 1. 2023 Energy Consumption by Energy Types (Gj)

### 3.3. Carbon Footprint

#### 3.3.1. Purpose

The purpose of carbon footprint calculation is to determine the annual emission status of IGU by calculating its carbon footprint in order to analyze the current situation regarding the historical data and determine the priorities of plans to reduce emissions.

#### 3.3.2. Scope

It is the calculation of only the primary carbon footprint values of the university using the data obtained from all units within IGU. The carbon footprint has been regularly calculated since 2018.

#### 3.3.3. Stages

Since 2018, for the carbon footprint values calculated; annual electricity and natural gas consumption data are obtained from the [Directorate of Construction And Technical Works](#) while the annual gasoline and diesel consumption data are obtained from the [Directorate of Support Services](#). Calculations are done with the gathered data. Based on the result, new targets are set and the success of the old targets in achieving the result is indicated.



### 3.3.4. Carbon Footprint Calculation Method

Therefore the university's carbon footprint calculation consists of electricity, transportation and heating which result from carbon emissions. Carbon Dioxide emission being related to combustion of fuel makes it easier to calculate. Other Greenhouse gasses require many more criterias for the calculation. The IPCC calculation method is divided into 3 tiers. Tier 1 has been used in this report. For this instance;

1. Consumption amounts of gasoline, diesel, LPG, natural gas and electricity were taken from the official university records. The IPCC carbon dioxide emission factor of 0.584ton/mWh which is specified in the master's study prepared by Toröz (2015: 79) was used for the calculation of emissions resulting from electricity consumption.
2. Energy content is calculated by multiplying the consumption values of fuels by the conversion values given in the IPCC guidelines. Conversion values are the values specified in the IPCC 2006 guidelines and included in the Communiqué on Monitoring and Reporting of Greenhouse Gas Emissions published in the Official Gazette dated 22.07.2014 with the number 29068. These values are listed in Table 6.

**Table 6:** Net Calorific Value of Fuels (Source: ÇŞB, 2014:40)

Fuel Type	Net Calorific Value (Tj/Gg)
Gasoline	44,30
Diesel	43,00
Natural Gas	48,00

$$\text{Energy Consumption (TJ)} = \text{Fuel Consumption (t)} \times \text{Net Calorie Value (TJ/Gg)}$$

3. For each fuel group that is specified in the IPCC guidelines the carbon emission factors are selected and the total carbon content of the fuel is calculated using this value.

$$\text{Carbon Content (t C)} = \text{Carbon Emission Factor (t C/TJ)} \times \text{Energy Consumption (TJ)}$$



**Table 7:** Emission Factor Of Fuels (Source: TUIK, 2013:16)

<b>Fuel Type</b>	<b>Net Calorific Value (TJ/Gg)</b>
<b>Gasoline</b>	18,90
<b>Diesel</b>	20,20
<b>Natural Gas</b>	15,30

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

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

**Table 8:** Oxidation Rate Of Fuels (Source: ÇŞB, 2014:40)

<b>Fuel Type</b>	<b>Net Calorific Value (TJ/Gg)</b>
<b>Gasoline</b>	0,990
<b>Diesel</b>	0,990
<b>Natural Gas</b>	0,995

5. At this stage, the ratio 44/12, which is the ratio of the molecular weight of CO<sub>2</sub> to the molecular weight of carbon, is multiplied by the value found in the previous step to find the CO<sub>2</sub> emission value resulting from the combustion of the fuel.

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



### 3.3.5. Carbon Footprint Calculation Result

Gasoline, diesel and natural gas consumption data for 2023 obtained from the University are calculated and shown in the table below.

**Table 9:** Carbon Footprint of IGU (2023)

Energy Type	Consumption Amount	Consumption Amount (Ton)	Net Calorie Value (TJ/Gg)	Carbon Emission Factor (tC/TJ)	Carbon Oxidation Rate	Ton CO2	Percent (%)
Gasoline(L)	10.600,32	8,09	44,30	18,90	0,990	24,592	0,95%
Diesel(L)	24.692,56	20,99	43,00	20,20	0,990	66,176	2,56%
Natural Gas(m3)	123.936,00	82,34	48,00	15,30	0,995	220,606	8,52%
Electricity(k Wh)	3.901.005,16					2.278,187	87,98%
<b>Total</b>						<b>2.589,561</b>	

### 3.3.6. Carbon Footprint by Years

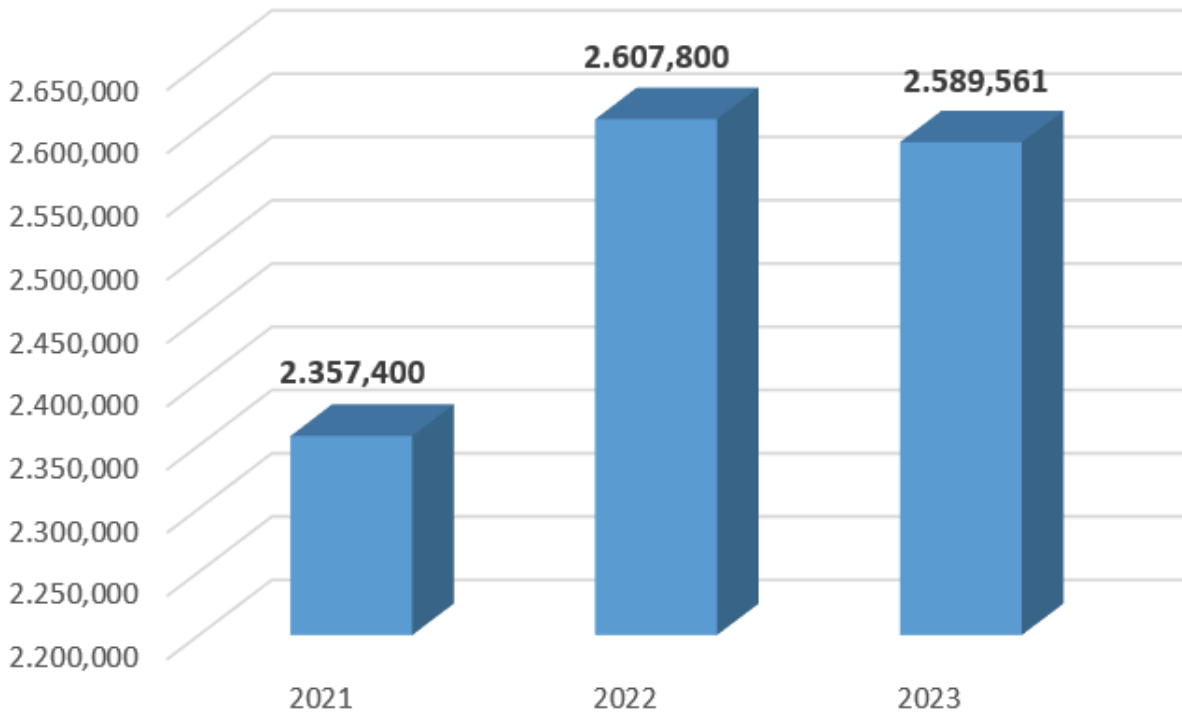
In 2022, there is an increase of approximately 10% compared to the previous year. The reason for this is that after the Covid-19 outbreak, the education given at the university has started to be face-to-face since September 2021, and the student density, offices, classrooms and application laboratories used have increased compared to the previous year. Therefore, there has been a natural increase in the energy sources used (especially natural gas and electricity).

In 2023, there was an increase in petrol and diesel carbon footprint compared to 2022. The reason for this is the increase in the number of vehicles compared to 2022.

In 2023, as a result of the measures taken in 2023 compared to 2022, the carbon footprint due to natural gas consumption decreased. Likewise, as a result of the improvements made in the IGU, there was a decrease in electricity use in 2023 and thus a decrease in the carbon footprint from electricity in 2023 compared to 2022. While the 2022 electricity carbon footprint was **2.310,990**, this number decreased to **2.278,187** in 2023.



When we look at the total carbon footprint of IGU, the carbon footprint, which was **2.607,800** tonnes (gasoline, diesel, natural gas, electricity) in 2022, decreased to **2.589,561** tonnes of CO<sub>2</sub> in 2023 and started to reap the rewards of its efforts step by step. It is aimed to further reduce these values in the coming years.



**Figure 2.** Carbon Footprint by Year (Ton CO<sub>2</sub>)

### 3.4. Energy Use Intensity of University Buildings

2023 electrical energy intensity in university buildings is calculated per building floor area (m<sup>2</sup>). The values are shown in kWh and gigajoules (Gj) in the table below.



**Table 10.** Electric Energy Consumed per Floor Area of IGU Blocks

Blocks	Energy Consumption Intensity (kWh/m <sup>2</sup> )	Energy Consumption Intensity (Gj/m <sup>2</sup> )
A Block	19,77	0,071
B Block	7,99	0,028
C Block	16,19	0,058
D-E Block	4,30	0,015
F Block	13,71	0,049
G Block	11,28	0,040
K Block	19,80	0,071
<b>Total</b>	<b>93,04</b>	<b>0,332</b>

The energy intensity per floor area of the university is shown in the table below. Total energy consumption was found to be 15,294.499 Gj and the energy use per square meter is shown in the table below.

**Table 11.** Energy Use per Square Meter

Energy Type	Consumption Amount (Gj)	Energy Consumption Intensity (Gj/m <sup>2</sup> )
Gasoline	362,530	1,5045
Diesel	883,993	3,6686
Natural Gas	4,358	0,0180
Electricity	14.043,618	58,2819
<b>Total</b>	<b>15.294,50</b>	<b>63,4730</b>





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#### 4. Carbon Management and Processes Established to Reduce Carbon Dioxide Emissions

As IGU, one of our priorities is to save energy and reduce carbon emissions that harm the environment. The use of automation and LED lighting indirectly serves our purpose by reducing energy consumption. IGU also organizes presentations to raise awareness among its students and staff about carbon emissions. In order to reduce the carbon footprint, efforts are made to save water, electricity, heating and transportation. At the same time, environment-friendly, energy-saving and low-carbon emission devices are preferred for the products supplied during the procurement processes.

In this regard, zero emission vehicles were purchased on 26.12.2023.

Click: [Electric Vehicle Purchase for Sustainability](#)

In addition, projects to reuse rainwater and greywater are produced and studies are carried out for the purpose of saving and awareness. One of these rainwater systems was implemented at our Tower campus in 2023. By applying exterior sheathing to our buildings, heating losses have been prevented and our natural gas consumption has decreased. In addition, engine oil, engine filter, air filter and oil filter are changed every 6 months in order to reduce the fuel consumption of generators and reduce carbon emissions. Additionally to the maintenance, regular checks are carried out every month. In this way, we also reduce the fuel to be consumed during outages and reduce carbon emissions. Compared to 2022, the consumption of petrol and diesel has increased, due to additional car purchases at the university. In order for the university to further reduce these values and ensure continuity, it is planned to provide training that will raise awareness about the use of these factors affecting the carbon footprint.

The studies carried out in this context are listed below:

1. Fluorescent lamps used in the campuses are being reduced year by year. These fluorescent lamps are being replaced with longer lasting and less energy consuming LED lighting. This work will provide a higher level of illumination with less cost by reducing the number as well as consumption, in other words, it will increase efficiency. In 2023, 6264 fluorescent lights were replaced with 6084 LED lights in the areas according to this plan. With this change, the total number of illuminations were decreased and the LED illumination rate, which was 46,5%, was improved to 78,49%. Values are expressed in Table 12.



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**Table 12.** Changes in total lighting and LED lighting numbers by years

Years	Total Lighting	Led Lighting	Led Lighting Rate
2018	17.337	5.548	32%
2019	18.153	6.669	36,70%
2020	19.153	7.769	40,50%
2021	19.542	8.794	45%
2022	19.460	9.048	46,50%
<b>2023</b>	<b>19.280</b>	<b>15.132</b>	<b>78,49%</b>

2. Automation and field devices in the tower campus were replaced. With this work a more efficient system has been created.
3. IGU has YEK-G and The International Rec Standard certificates. These two certificates demonstrate the use of renewable energy in the electricity supply process on university campuses and buildings. Since 2021, all of the electricity consumed by IGU has been obtained from the renewable energy produced in hydroelectric power plants. The objective is to incorporate clean and sustainable energy into all activities and general consumption within the university.
4. Since frequent malfunctions occur in common areas such as corridors, toilets, etc. in the new campuses, sensor installations were completed according to the traffic situation during the day. By doing so, it is aimed to prevent unnecessary electricity consumption.
5. Policies on the use of renewable energy (wind and solar energy) have been increased.
6. IGU, which is on the way to becoming a university that produces its own needs, has started working on a "Solar Energy System" for electricity generation. Preparations are underway to establish a solar power plant with an installed capacity of 4000 kWh for electricity generation.
7. Before the renovations, the offices had a large number of electric heaters in addition to central heating resulting in significant electricity consumption. By ensuring efficient use of heating systems, the use of heaters has been prevented.



8. In order to reduce the carbon footprint by regular sapling planting / forestation activities continue every year. In this context, 1 greenhouse was established.



9. We continue to adhere to the procurement specifications prepared to ensure that energy saving is at the forefront of the selection criteria in the procurement processes of new devices to be used in the campuses.

10. Compensation panels used to prevent losses that affect total energy consumption are regularly maintained.

11. The use of electrical appliances such as tea and coffee makers etc. in staff offices increases energy use. In order to reduce energy use, we are working on establishing common kitchen areas in the campuses. In this context, 2 areas were established in the tower campus.

12. Training activities are organized for all personnel on energy efficiency within the timeframe of a certain periodic calendar throughout the year.

13. Measures have been taken to raise awareness on reducing consumption through the use of warning signs and posters.

14. In addition, with the vegetable waste oil collection contract, IGU contributes to sustainability by ensuring that waste oils are collected by the relevant environmentally licensed recovery facilities and vegetable waste oil interim storage facilities.





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**Our recommendations to reduce the carbon footprint of the university are as follows:**

- In order to reduce the carbon footprint efforts should be made to save water, electricity, heating and transportation. Also making sure that the decisions taken are with the same consistency ensure products to be purchased are environmentally friendly, energy-saving and low carbon emission.
- The commitment and support of the senior management is very important for the university to reduce its carbon footprint and to ensure the sustainable use of resources.
- Training activities and projects should be carried out to increase the awareness of stakeholders in combating environmental problems and global climate change.
- It should be ensured that elective courses on environmental issues, nature conservation, global climate change and sustainable use of natural resources are included in the curriculum of all departments of the university.
- Waste management plans should be put in place to minimize waste generation (reduction at source) and ensure that waste is separated at source and recycled.
- Efforts should be made to promote the use of environmentally friendly products (cleaning materials, fuel, etc.) and the use of recycled materials.
- Efforts to use renewable energy (wind and solar energy) should be increased and the university should be able to provide its own energy.
- Regular sapling planting / forestation activities should be carried out every year in order to reduce the carbon footprint.
- In the use of ornamental plants on campus, local and drought-resistant plant species should be used.
- Projects for the reuse of rainwater and greywater should be developed to save money and raise awareness.
- Necessary work should be done to ensure that new buildings are environmentally friendly green buildings.



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## 5. Energy and Society

**Event Name:** GELİŞİM-2023 7th International Conference on Economics and Finance

**Event Date:** 05.10.2023

**Event Content:** The International Conference on Economics and Finance entitled "The Economic Order of the Future: Economic Challenges in the Face of Climate Change, Energy Bottlenecks and War", the International Conference on Economics and Finance addressed important issues affecting the global economy. Themes such as climate change, energy security and economic instability were discussed in depth and solution-oriented approaches were presented. The conference emphasized the need to develop and make accessible sustainable energy solutions.

[Event Link](#)





**Event Name:** Panel On Sustainability in Aviation

**Event Date:** 24.10.2023-25.10.2023

**Event Content:** The panel, which emphasized the importance of sustainability, one of the most important issues of recent years, in the aviation sector, was held on October 24-25 in the K Block Auditorium hall with external participants and listeners who are experts in their fields. The panel, which aimed to lay the foundations for a sustainable future and raise conscious aviators, lasted for two days and emphasized the values of "Sustainable Development Goals".

[Event Link](#)





**Event Name:** Clean Waste

**Event Date:** 31.10.2023

**Event Content:** The use of recycling bins and clean waste management at our university is a social responsibility project in line with the SDG7 development goals of accessible and clean energy. This project aims to contribute to energy saving and environmental protection by raising awareness of students and academic-administrative staff on recycling and sustainability issues. In this context, it is aimed to inform students and academic-administrative staff about the use of recycling bins as well as clean waste in order to realize a social responsibility project on the subject.

[Event Link](#)





**Event Name:** Evolution Of Aircrafts

**Event Date:** 15.11.2023

**Event Content:** The relevant instructor gave an interview to the students about the evolution and development of aircrafts until today. In this activity, the historical development of aircraft and current technological advances were conveyed to the students and awareness was raised. In terms of clean energy development, the use of innovative and environmentally friendly technologies in the aviation sector is important. Such events aim to raise the interest and awareness of young people in order to encourage future aircraft to be more efficient and environmentally friendly. Therefore, the "Evolution of Aircraft" event was organized to support SDG7's efforts on clean energy transition and sustainable aviation technologies.





**Event Name:** Cities to be Built with Safe and Sustainable Structures)

**Event Date:** 06.12.2023

**Event Content:** This event introduced students to issues such as environmental sustainability, disaster management and energy efficiency from the perspective of safe and sustainable buildings, which have an important place in urban planning. The design of sustainable buildings and their integration with the city and their contribution to the creation of energy-efficient and environmentally friendly cities were discussed.





**Event Name:** Çorlu Atatürk Airport  
Atlantic Flight Academy (AFA)  
Technical Trip

**Event Date:** 29.12.2023

**Event Content:** Students visited the academy's hangars and workshops and had the opportunity to observe the technical knowledge and skills in the aviation industry. This visit aimed to help students understand how energy efficiency and environmentally friendly practices can be integrated into future aviation technologies.





**Event Name:** Recycling Labor in the Context of Poverty and Social Exclusion

**Event Date:** 01.12.2023

**Event Content:** In the context of poverty and social exclusion, it was aimed to address recycling work in terms of well-being and healthy working conditions and to evaluate the effects of this situation on the aging process. This evaluation on the well-being and healthy working conditions of recycling workers emphasized the importance of innovative approaches and environmentally friendly technologies in waste management processes.





**Event Name:** On the Trail of Green Art: Pigment and Paper Making Workshop

**Event Date:** 29.11.2023

**Event Content:** In the second stage of the project "In the Footsteps of Green Art: Pigment and Paper Making Workshop" project, paper was re-produced from waste paper and colored with natural pigments. This workshop aimed to raise students' recycling and environmental awareness. While recycling encouraged the efficient use of resources, the use of natural pigments supported environmentally friendly art practices.

[Event Link](#)





**Event Name:** Doç. Dr. Sibel Avcu  
Tuğal- Personal Exhibition  
**Event Date:** 21.11.2023  
**Event Content:** Assoc. Prof. Dr. Sibel  
Avcu Tuğal's digital works were  
exhibited. In the exhibition, digital art  
examples were intended to be presented  
to the audience.

[Event Link](#)



## 6. Initiatives Supporting Low Carbon Economy/Technology

Information on the projects in the IGU, which are based on sustainability, primarily to promote a low-carbon economy, is presented in the table below.

**Table 13.** Information on Projects

Project Name	Project Content	Project Budget	Stakeholder Type	Project Type	Social Responsibility
İstanbul Gelişim Üniversitesi Kule Binasının Karbon Ayak İzinin Hesaplanması ve Yapay Zekâ Yöntemleri İle Kısa Orta ve Uzun Dönem Yük Tahmini Gerçekleştirilmesi	Load Forecasting, Artificial Intelligence Techniques, Carbon Footprint, Energy Metering, Energy Consumption	13901,8 ₺	Internal Stakeholder (İGÜ Bap-K)	Normal Research Project(NRP)	No
Aralık Tip2 Bulanık Ahp Kullanarak Yenilenebilir Enerji Kaynaklarının Seçimi	Renewable Energy Sources, Interval Type-2 Fuzzy Ahp, Fuzzy Multi-criteria Decision Making.	649,08 TL	Internal Stakeholder (İGÜ Bap-K)	Normal Research Project(NRP)	No
Mobil Şarj Hizmeti Odaklı Elektrikli Araçların Hizmet Yönetimi İçin Optimizasyon Tabanlı Belirsizlikten Haberdar Hiyerarşik Bir Karar Verme Mekanizması Geliştirilmesi Sözleşmesi		60.000,00TL	İGÜ	TÜBİTAK 1002	No
İklim Krizi Etkilerinin Mimarlıkta Malzeme Alanına Yansımaları: Düşük Karbon Emisyonlu Malzemelere Yönelim		6.000,00TL	Student	TÜBİTAK Project	Yes





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