SAKARYA UNIVERSITY

SAKARYA UNIVERSITY SUSTAINABILITY REPORT

2020

Sakarya, Turkey

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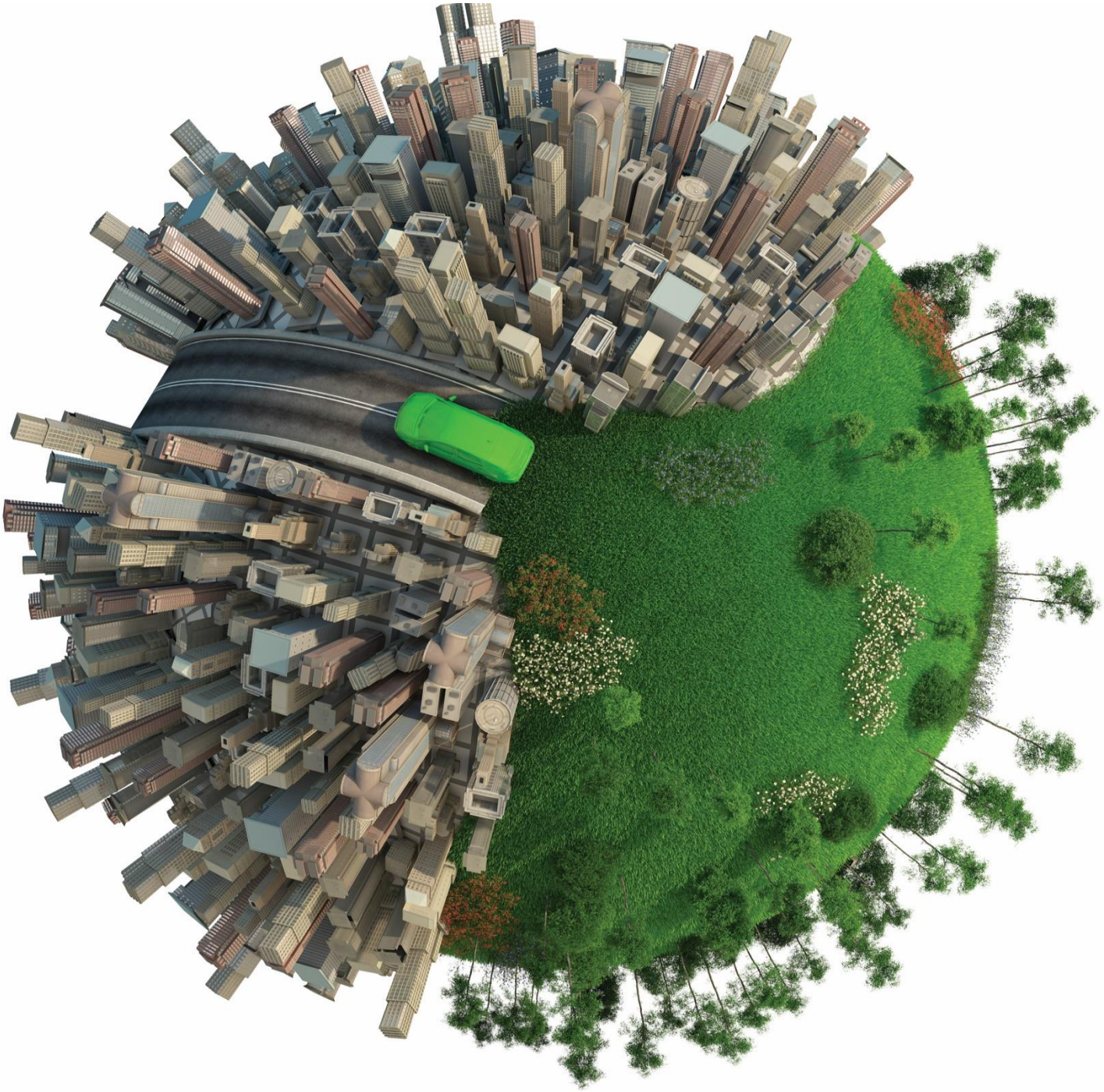


1. SETTING AND INFRASTRUCTURE

Sakarya University (SAU) is a public university settled in East Marmara which aims to train individuals with all kinds of equipments required by contemporary civilization. SAU is one of the most preferred universities for students because of its contemporary green campus, education and training facilities on an international level, diversity of education and training services, effective use of technology in its locations and processes, and importance of providing practical training. Managing its processes with its stakeholders, building its own network of collaborators, transferring the knowledge and technology it produces to the public have all enabled SAU to become an increasingly valuable asset for other actors in the industry, public institutions and society which benefit from its services.

SAU was founded in 1970 as Sakarya School of Engineering and Architecture and in 1971 was named Sakarya State Academy of Architecture and Engineerin g. In 1982, the academy continued its educational activities as an Engineering Faculty affiliated to Istanbul Technical University, and in 1992 it was transformed into Sakarya University.

There are 32 Research and Application Centers, six graduate schools, thirteen faculties, one state conservatory, three vocational schools, and a total of 411 programs are offered; 22 in associate degree, 145 in bachelor's degree, 160 masters and 84 Phd degree. Conventional, Evening-time and Distance Learning options are available for associate degree and bachelor's degree programs. In the graduate level, there are generalist, specialist master programs, with conventional and distance education alternatives, and doctoral programs.
Apart from the main campus of SAU, there are four campuses, Hendek Campus, where is Faculty of Education operates, Adapazarı Campus, where Faculty of Dentistry operates, Korucuk Campus for Faculty of Medicine and Dentistry Campus.

Main campus is widely regarded as one of the most green and attractive in the country. Set in extensive greenery with an excellent lake view, main campus is the focus of life for students, staff and visitors. Conveniently located only eight kilometers from the city center.

1.3. Number of Campus Sites

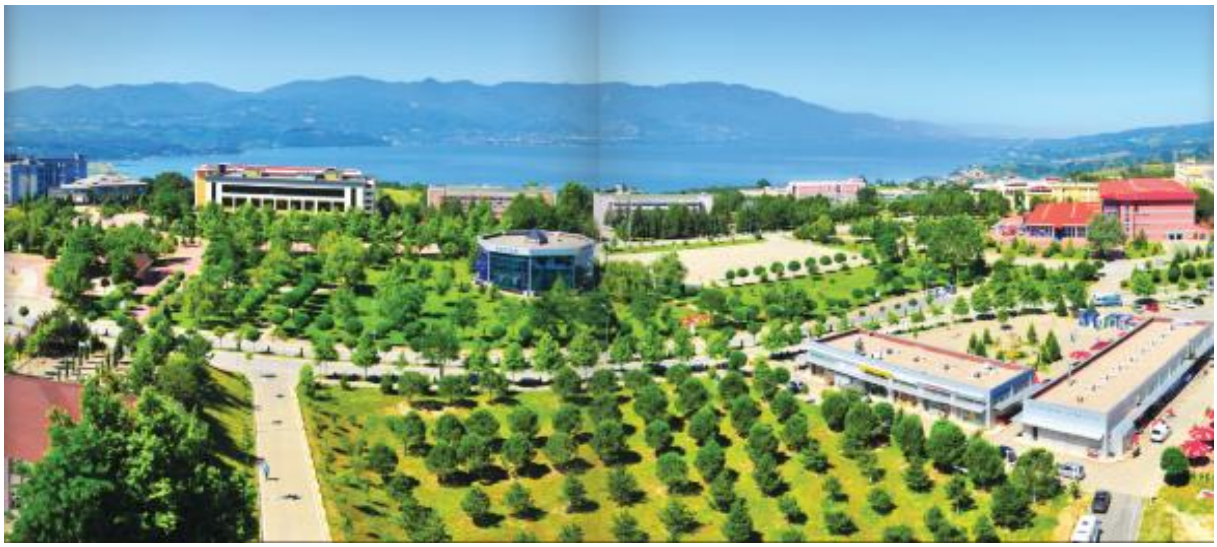


Figure 1: Main Campus

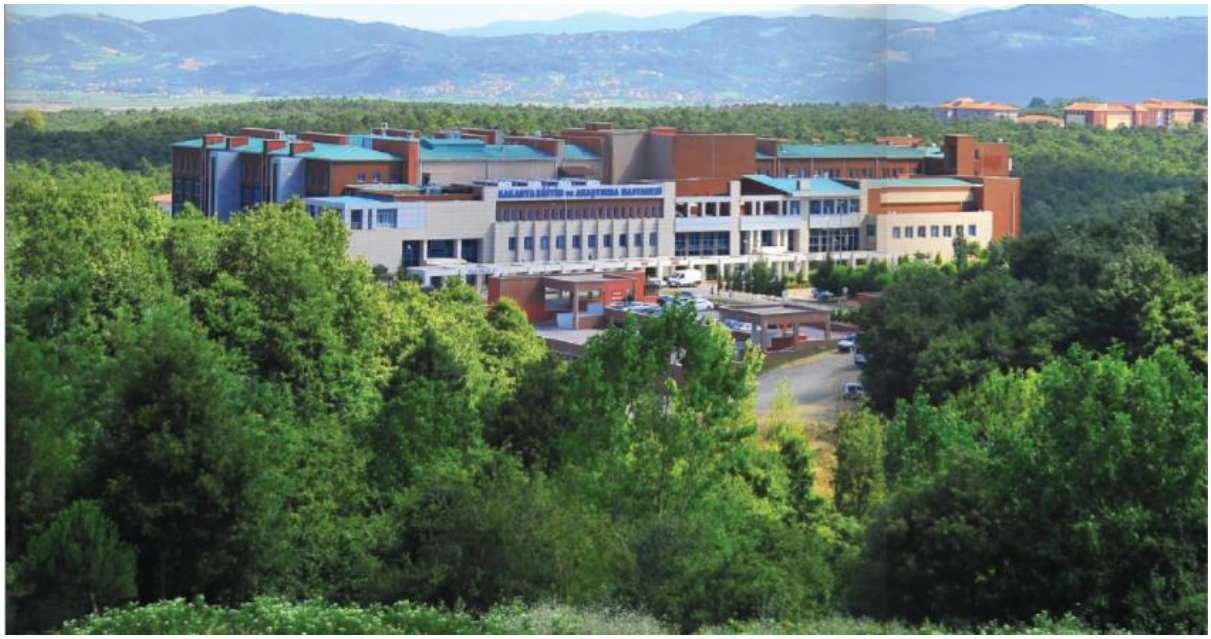


Figure 2: Korucuk Campus

Figure 3: Dentistry Campus

Figure 4: Hendek Campus

Figure 5: Health Services Campus

1.4. Campus Setting

Sakarya University campuses are located in the suburbs. As it is not located in the city center, the campuses are fascinating with their natural beauty and greenery. Especially the main campus is an oxygen paradise where blue and green meet.

Figure 6: Campus Setting - Suburban

1.5. Total Campus Area

Table 1: Total Campus Area

CAMPUSES	TOTAL AREA (in squaremeters)
MAIN CAMPUS	1600000
DENTISTRY	21.587,54
KORUCUK	390.584,24
HENDEK	11.067,58
HEALTH SERVICES	13.721,42
GRAND TOTAL	**2.036.960,78**

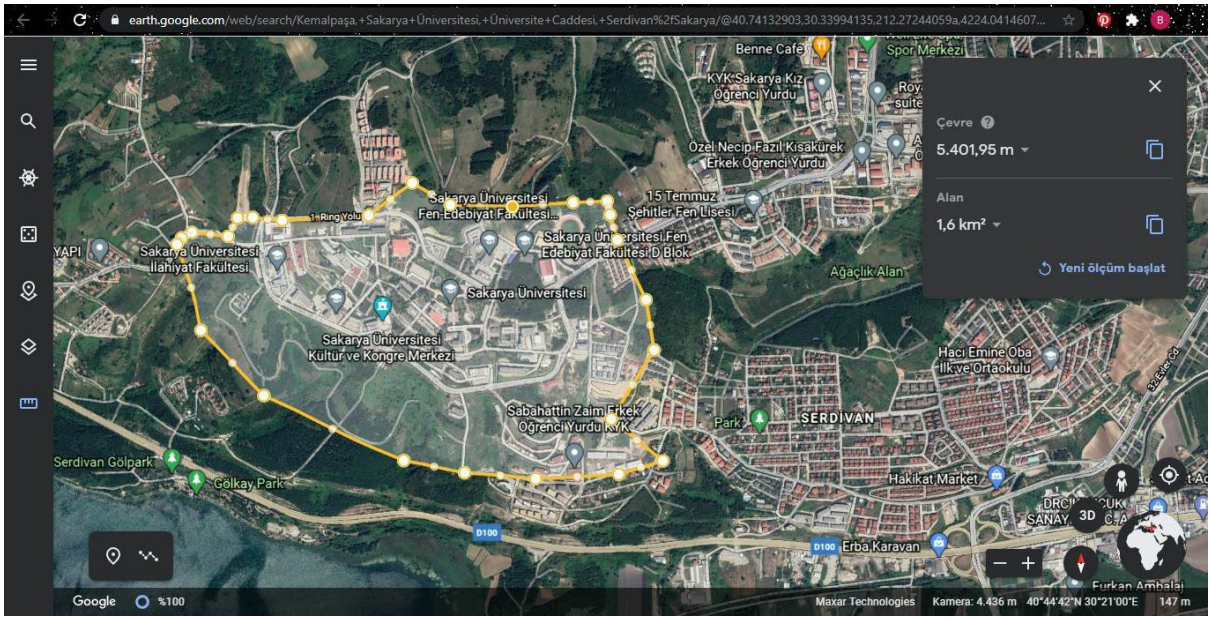


Figure 7: Main Campus Area

Figure 8: Dentistry Campus Area

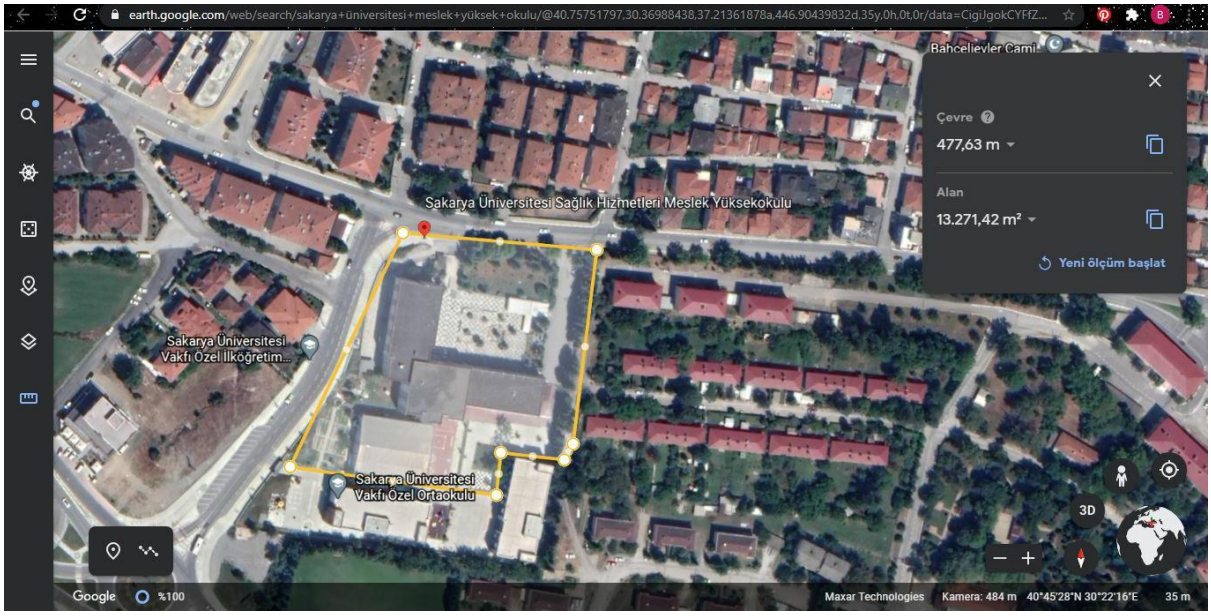


Figure 9: Health Services Campus Area

Figure 10: Korucuk Campus Area

Figure 11: Hendek Campus Area

1.9. Total Area on Campus Covered in Forest Vegetation

Table 2: Total Forest Vegetation Area

CAMPUSES	FOREST VEGETATION AREA
MAIN CAMPUS	599328,41
DENTISTRY	9.365,96
KORUCUK	170.001,38
HENDEK	2.376,97
HEALTH SERVICES	1.313,17
GRAND TOTAL	**782.385,89**
FOREST / TOTAL AREA RATIO	**38 %**

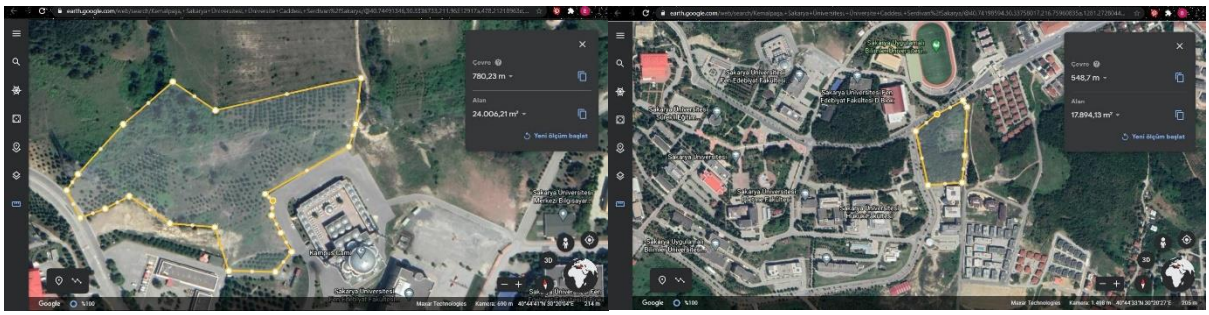


Figure 12: Total Forest Vegetation Area on Main Campus

Figure 13: Forest Vegetation Area – Hendek Campus

Figure 14: Forest Vegetation Area – Dentistry Campus

Figure 15: Forest Vegetation Area – Health Services Campus

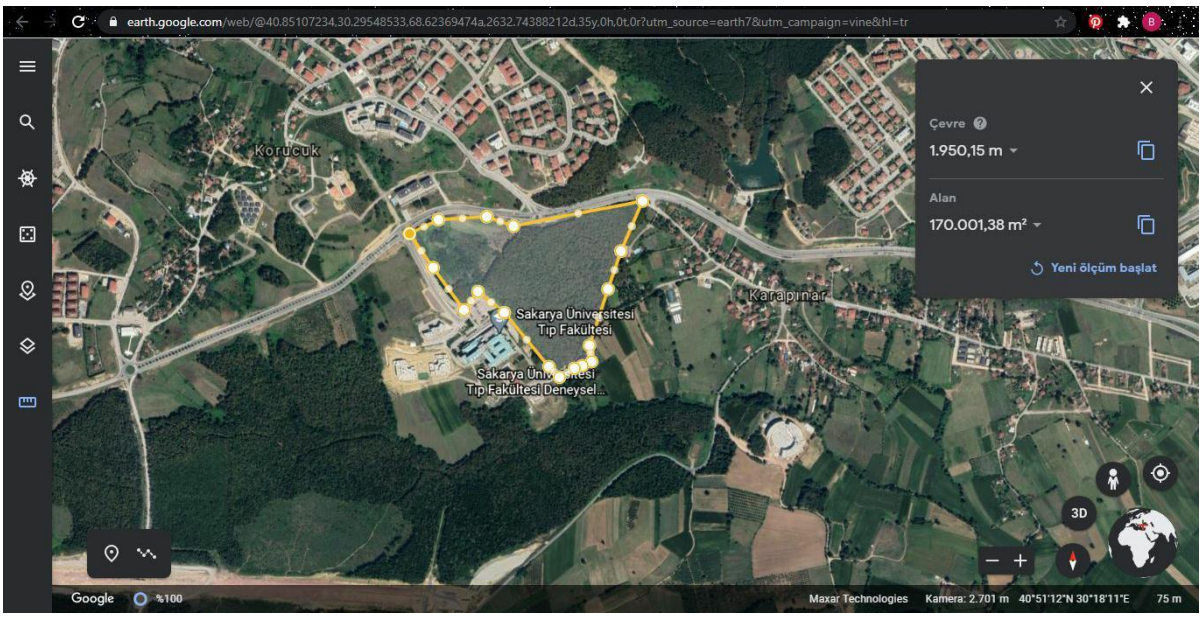


Figure 16: Forest Vegetation Area – Korucuk Campus

2. ENERGY AND CLIMATE CHANGE

2.1. Energy Efficient Appliances Usage

All new buildings in Sakarya University are equipped with energy efficient devices. In the renovation works of existing buildings, energy-saving devices are used completely, and products that are due for renovation are replaced with energy-saving products.

Table 3: Energy Efficient Appliances Usage

Appliance	Total Number	Total number energy Efficient appliances	Percentage
LED Lamp	97000	53500	55%
MDA	215	195	90%
		Average Percentage	**55,2%**

Figure 17: Use of LED lighting and lamps with light detection

Figure 18: Use of Energy Efficient MDAs

2.3. Smart Building Implementation

Table 4: Smart Building Features

No.	Name	Place	automation		safety				energy		water		Indoor environment				lighting				Building Area (m^2)
			B1	B2	S1	S2	S3	S4	E1	E2	A1	A2	I1	I2	I3	I4	L1	L2	L3	L4	
1	Sakarya University, Faculty of Theology	Sakarya, Turkey	X		X	X			X								X	X	X	X	13858
2	Sakarya University, Faculty of Computer and Information Sciences	Sakarya, Turkey	X		X	X			X								X	X		X	5839
3	Sakarya University, Congress Center	Sakarya, Turkey	X		X	X	X		X				X				X	X		X	6695
4	Sakarya University, Library Building	Sakarya, Turkey	X		X												X	X		X	4694
5	Sakarya University, School of Business	Sakarya, Turkey	X		X												X	X		X	10931
6	Sakarya University, Faculty of Engineering	Sakarya, Turkey	X		X												X	X		X	15042
7	Sakarya University, Continuing Education Center	Sakarya, Turkey	X		X												X	X		X	10485
	Total		**7**		**7**	**3**	**1**		**3**				**1**				**7**	**7**	**1**	**7**	**67544**

Smart building implementation
Total Building Area: 211,078 m²

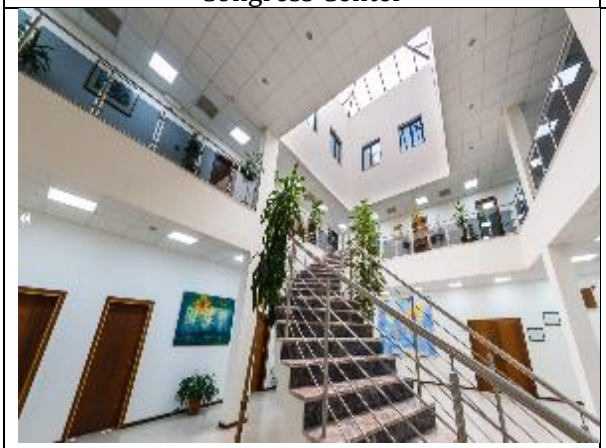
$$\frac{67544}{211078} \times 100\% = 32\%$$

Faculty of Theology

Faculty of Computer and Information Sciences

Congress Center

Library Building



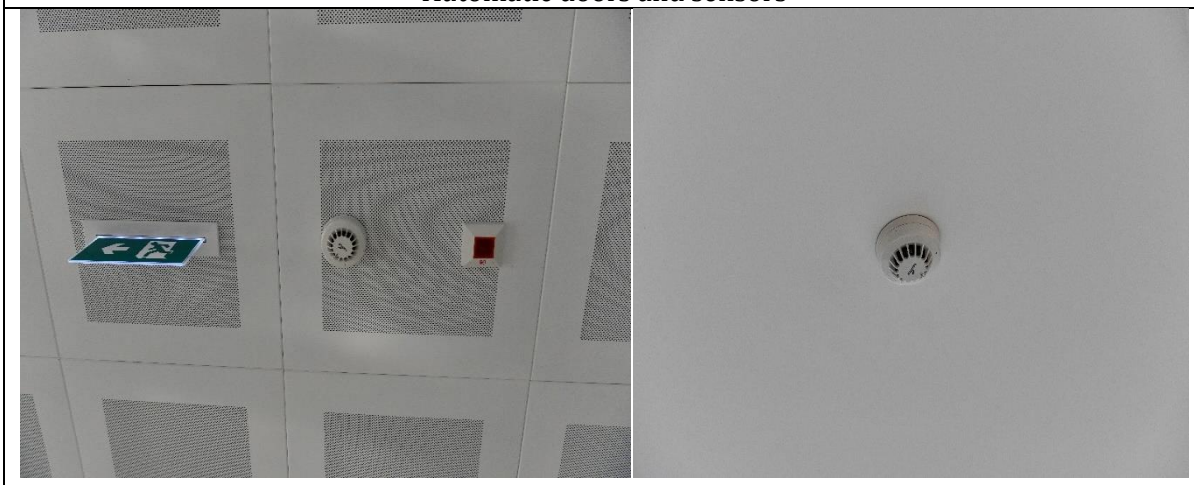
Faculty of Engineering

Continuing Education Center

Figure 19: Smart Building Implementations

Fire Alarm Control Center

Automatic doors and sensors



Automatic Fire Alarm Sensor

Lighting Sensor

Figure 20: Smart Building Tools

2.5. Renewable Energy Sources in Campus

On roofs of Faculty of Theology and Faculty of Medicine, solar PV power stations of total 72 KWH are installed.
Wind turbine power is 1 KWH in Energy Technologies Laboratory.

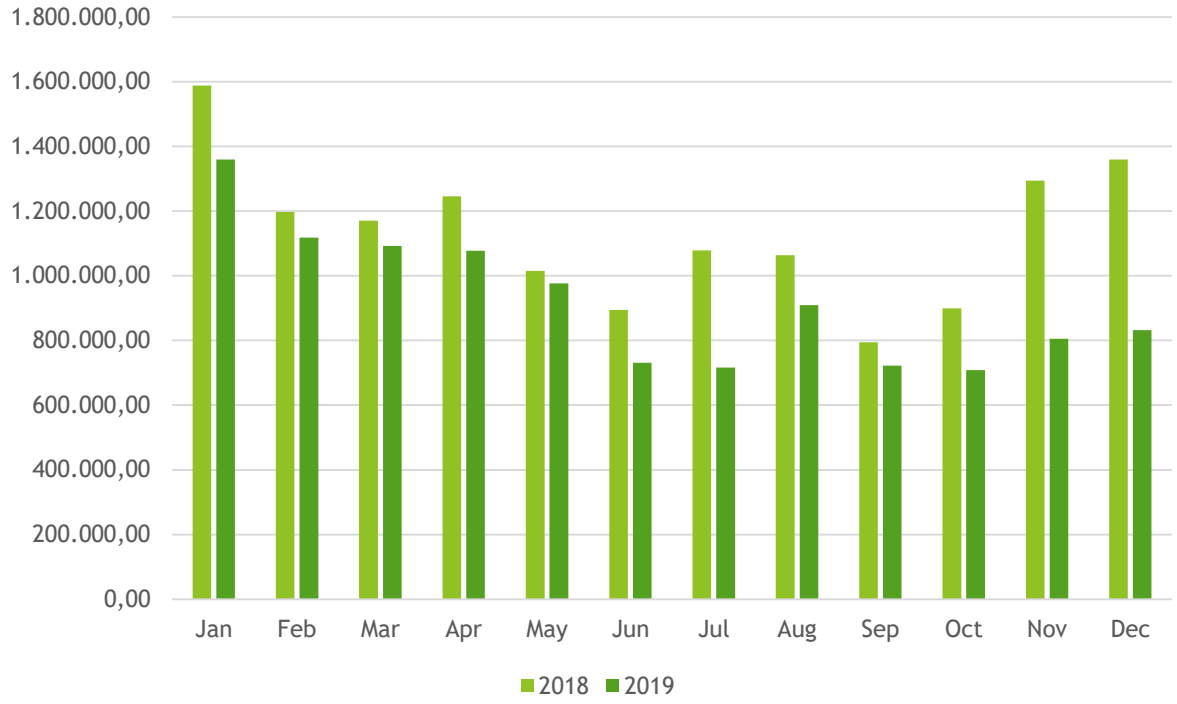
Figure 21: Roof Solar Panels

Figure 22: Wind Turbine

2.6. Electricity Usage per Year (in Kilowatt hour)

The total electricity usage of Sakara University in 2019 is 10.047.234 kWh. On the campuses electricity is used for lighting, cooling, heating and laboratory appliances.
The comparison of years shows that use of energy efficient appliances enabled a significant decrease in the electricity usage per month and also the grand total has been decreased.

Table 5: Electricity Usage



2.9. Green Building Implementations

Sakarya University campus renewal is made in terms of reaching smarter and greener buildings. For now, 80% of the buildings are designed for taking advantage of natural day lighting. 85% of the buildings have energy management centers and related staff for controlling and monitoring.

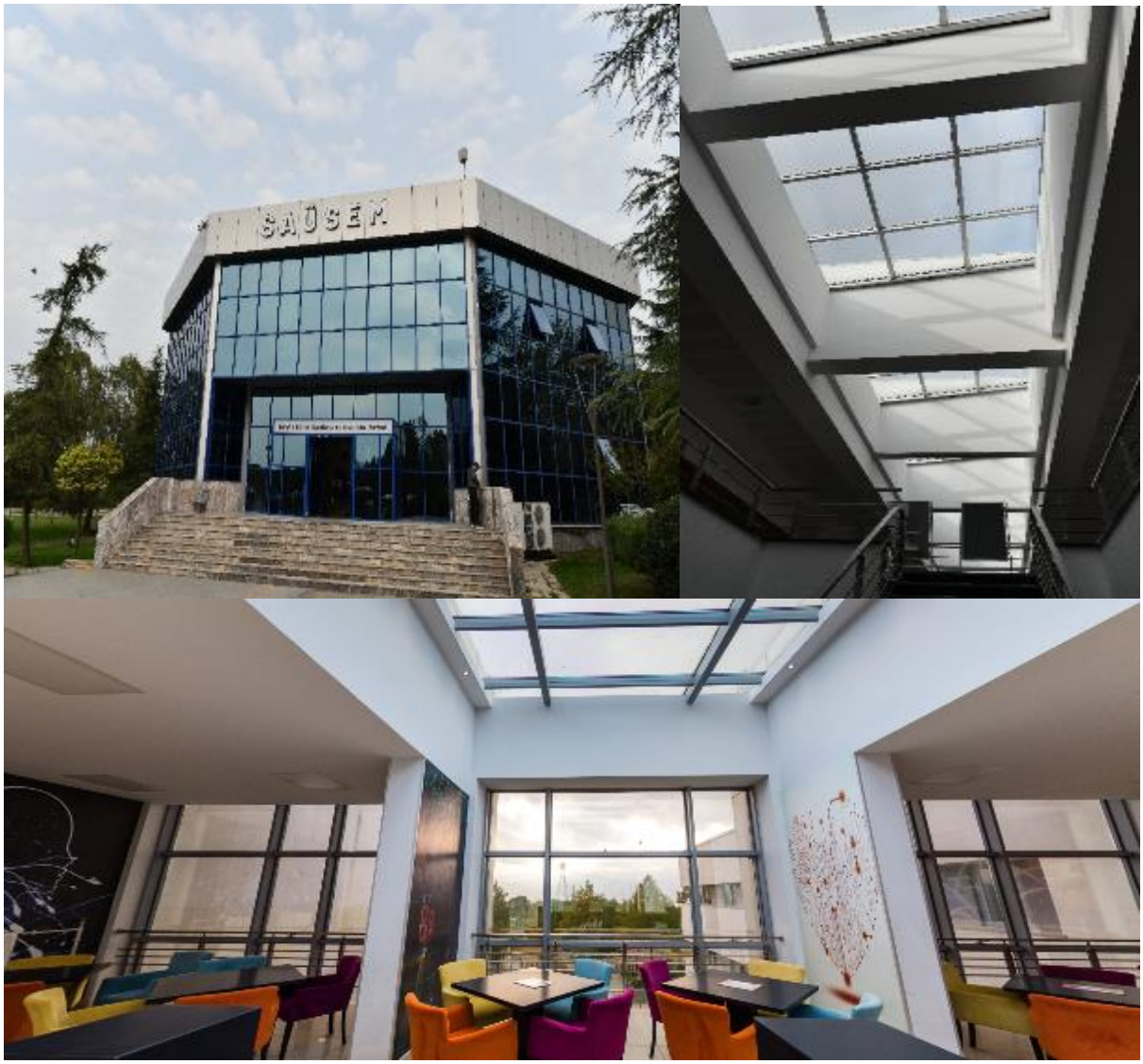


Figure 23: Natural Day Lighting Implementations

Figure 24: Energy Management Tools

2.11. Total Carbon Footprint

Total Carbon footprint in 2019 is measured as 10,556,40 metrictons according to the recommended calculation.

Calculation method recommended by UI GreenMetric

CO_2 (electricity)

$$= \frac{electricity\ usage\ per\ year\ (kWh)}{1000} \times 0{,}84$$

$$= \frac{10{,}762{,}031 kWh}{1000} \times 0{,}84$$

= 9040.1 metric tons

CO_2 (bus)*

$$= \frac{number\ of\ shuttle\ bus\ in\ your\ university \times total\ trips\ for\ shuttle\ bus\ service\ each\ day \times approximate\ travel\ distance\ of\ vehicle\ each\ day\ inside\ campus\ only\ (KM) \times 240}{100} \times 0{,}01$$

$$= \frac{600 \times 10 \times 4 \times 240}{100} \times 0{,}01$$

= 576 metric tons

* contains both bus and minibus

CO_2 (cars)

$$= \frac{\text{number of cars entering your university} \times 2 \times \text{approximate travel distance of vehicle each day inside campus only (KM)} \times 240}{100} \times 0{,}02$$

$$= \frac{2{,}214 \times 2 \times 4 \times 240}{100} \times 0{,}02$$

= 926.9 metric tons

CO_2 (motorcycle)

$$= \frac{\text{number of motorcycle entering your university} \times 2 \times \text{approximate travel distance of vehicle each day inside campus only (KM)} \times 240}{100} \times 0{,}01$$

$$= \frac{70 \times 2 \times 4 \times 240}{100} \times 0{,}01$$

= 13.44 metric tons

CO_2 (total)

= 9040.1 + 576 + 926.9 + 13.44

= 10,556.4 metric tons

Carbon footprint in 2019 = 10,556.4 metric tons

3. WASTE

3.1. Recycling Program for University Waste

Sakarya University employs a local recycling service served by the metropolitan municipality, which implements environment friendly recycling systems and waste disposal. Out faculty and students have been informed about determining what they can and cannot recycle. Additionally, a fashion Show has been prepared for creating awareness about the potantial of recycling of wastes. Sakarya University also promotes the recycling of glass, plastic, metal, battery and electronic Waste and ink-cartridges from printers. E-waste items should not be disposed of in the normal trash due to their high concentrations of toxic chemicals and heavy metals. Besides a toxic waste storage has been built on the main campus.

Figure 25: Creating Awareness for Recycling Program for University Waste

Figure 26: Flyer for Recycling Program

Figure 27: Digital Waste Gathering

Figure 28: Gathering Units for Recycling Awareness Program

Figure 29: Waste bins for paper, plastic, metal, glass, contaminated and medical waste

3.2. Program to Reduce the Use of Paper and Plastic on Campus

Four programs are implemented in order to reduce the use of paper and plastic by Sakarya University.
The first of these is the Electronic Document Management System, which enables all official correspondence to be made completely electronically without printing. This program ensures that correspondence, which holds thousands of pages per year, is stored electronically safely and efficiently and accessed when necessary.

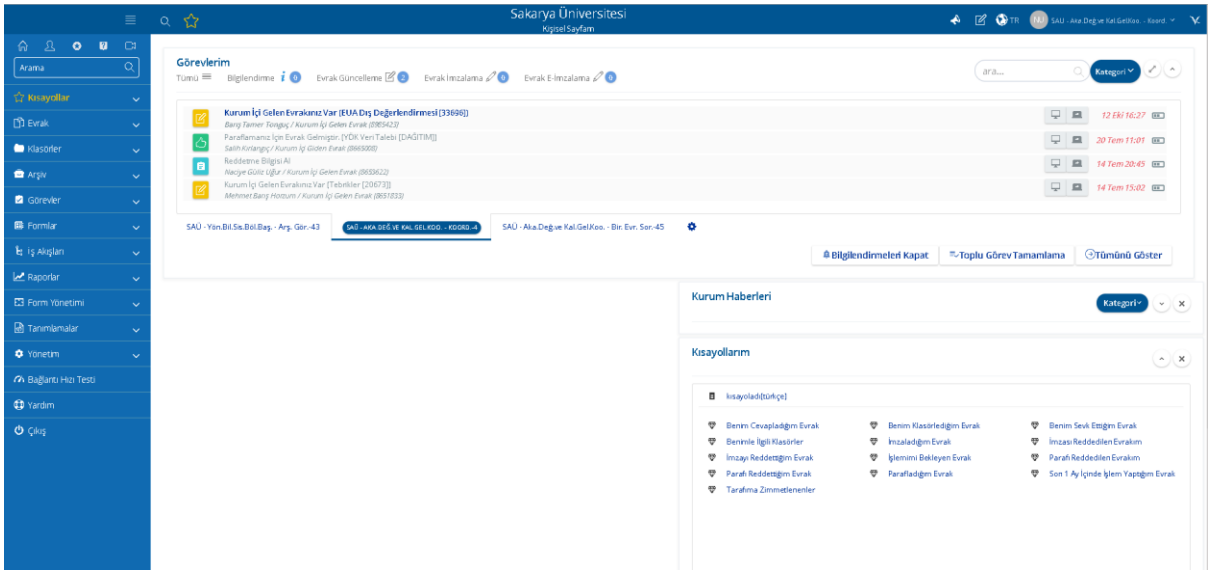


Figure 30: Electronic Document Management System

The second application is a two-way printing policy. All academic and administrative staff are encouraged to make two-way printouts and it is aimed to save 50% paper.

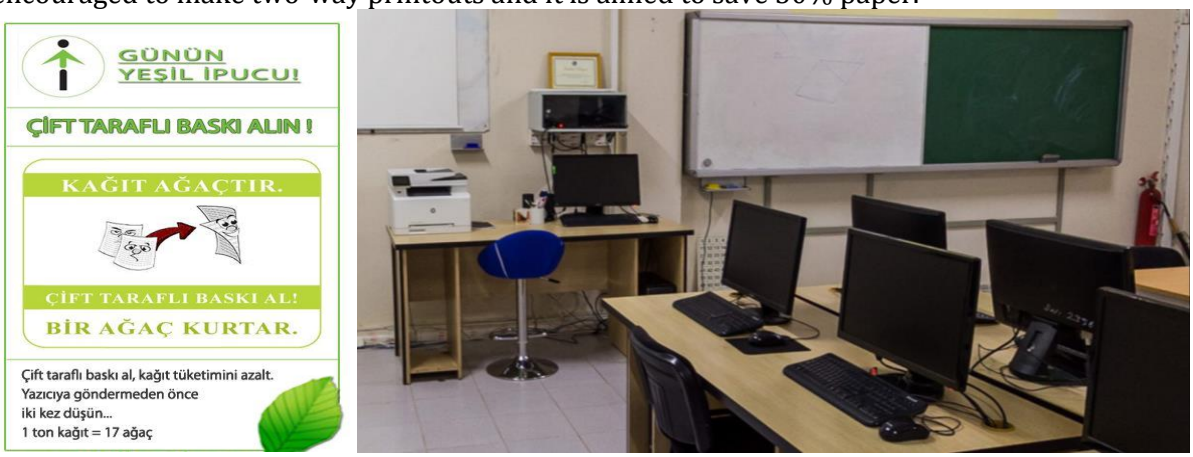


Figure 31: Implementations to Reduce the Use of Paper

The third program is to reduce the number of printers and direct those who need it to a common printer in order to print out only when necessary. In addition, output quota is applied for all administrative and academic staff and statistics are monitored by senior management.

Figure 32: Implementations to Reduce the Use of Plastic

Finally, Sakarya University aims to reduce the use of disposable products. For this purpose, glass cups and porcelain plates are served in all catering centers of the university, thus preventing the use of paper and plastic cups.

3.3. Organic Waste Treatment

In Sakarya University, the only structures that produce organic waste are dining halls, canteens and cafes, which manage in complete autonomy this kind of waste. The wastes in the dining hall pass through the oil filter and go to the sewer. The dining halls, canteens and the cafes manage the organic waste trough contracts with Sakarya Metropolitan Municipality Environmental Services Unit. The Municipality staff collect the organic waste and deliver them at Sakarya Metropolitan Municipality waste treatment plant that processes the material through anaerobic digestion.

Figure 33: Organic Waste Treatment

3.4. Inorganic Waste Treatment

Inorganic Waste treatment in Sakarya University aims to gather plastic, glass, metal, paper, digital and medical waste and deliver them to waste treatment area for recycling and also for the classification of valuable materials for reuse.
Sakarya University work with Sakarya Metropolitan Municipality. The staff gathers the waste from the campus regularly. The faculty may also call the environmental sevices office for gathering the batteries or the digital waste when enough amount of waste is collected.
Several programs are implemented to create awareness fro classifying and delivering the waste for recycling, these are referred under the heading for recycling programs.

Figure 34: Inorganic Waste Treatment

Figure 35: Digital Waste Treatment

3.5. Toxic Waste Treatment

Toxic and hazardous wastes of Sakarya University are stored in a special collection area, given to IZAYDAŞ at regular intervals, thus ensuring that they are disposed of without any harm to the environment. All toxic wastes of the university are necessarily disposed of in this way. In addition, hazardous waste such as batteries and printer cartridges are also collected and recycled.

Figure 36: Toxic Waste Storage

Figure 37: Printer Cartridge and Battery Gathering

3.6. Sewage Disposal

All sewage wastes of Sakarya University are processed in the wastewater treatment facility of Sakarya Metropolitan Municipality. It is ensured that no untreated sewage waste is discharged into the sea. The treated wastewater is discharged back to the natural environment.

Figure 38: Sewage Disposal

Additional link:
https://www.sakarya-saski.gov.tr/media/gallery/62ec9344-c604-435d-95e6-e216fb9857f2.pdf
https://www.sakarya.bel.tr/tr/Haber/sehre-3-yeni-atiksu-aritma-tesisi/7233

4. WATER

4.1. Water Conservation Program Implementation

All buildings of Sakarya University have a separated sewerage system, for waste water and for clean water (rainwater). Rain water is thus collected from the roofs of the buildings and is then discharged into the water channels around the buildings.

Figure 39: Water Conservation – Rainwater Collection

There is also en extended project which is now in preparation. The feasibility studies have been done and several academic papers have been published by the experience gained through the feasibility processes. This study aims to investigate the potential of rainwater collected from the building roofs for irrigation of green areas located within the campus of Sakarya University. For this purpose, due to large area and location difference of the buildings, campus area is divided into 8 regions. In each zone, building roof area was calculated and amounts of rainwater to be collected from each building are evaluated by using average annual rainfall data obtained from Sakarya Region Directorate of Turkish State Meteorological Service. In addition, the area of green land and amount of required rainwater was calculated in each region to determine how much of irrigation need will meet by collected rainwater.
Additional Link:
https://www.isites.info/PastConferences/ISITES2016/ISITES2016/papers/A18-ISITES2016ID66.pdf

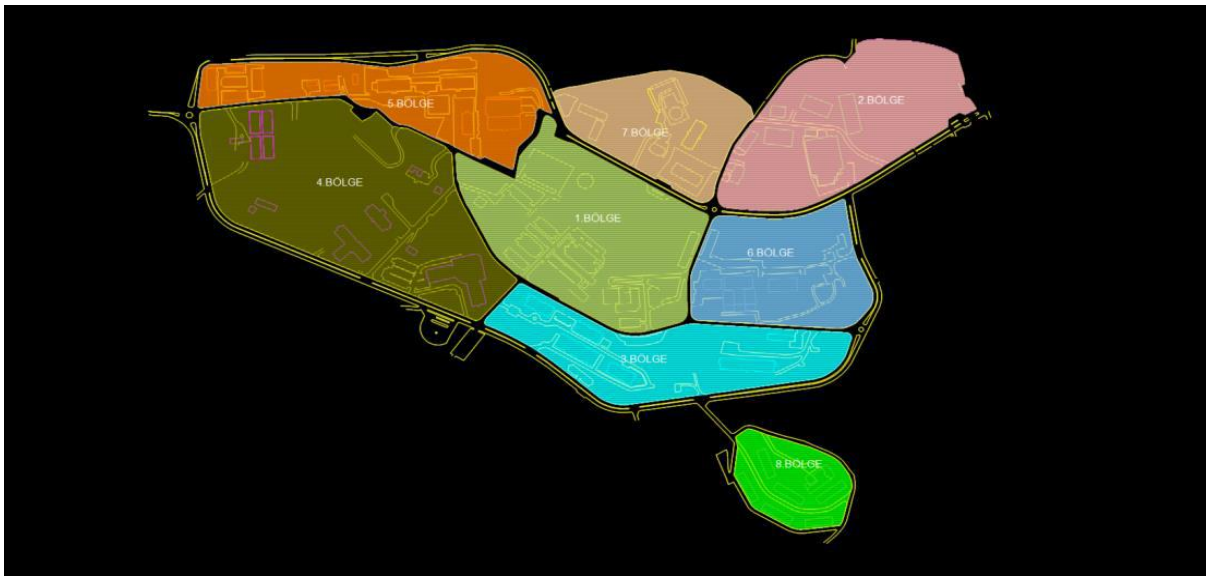


Figure 40: Eight regions of Sakarya University - Feasibility Studies

4.2. Water Recycling Program Implementation

In Sakarya University, as a result of the rainwater harvest the water bowls for street animals are automatically filled.
The water recycling program is at the development stage so the feasibility processes continue to enhance natural watering capabilities.

Figure 41: Water Recycling Programs

4.3. Water Efficient Appliances Usage

In Sakarya University, a comprehensive water saving program is implemented. In many buildings, water saving is achieved by widespread equipment such as photocell faucets, photocell flusher and urinals. In addition, water-efficient spray filters are used at the ends of the taps. For efficient waste of water, cistermisers (automatic control of urinal flushing), waterless urinals, low flush WC's and low flo taps and automatic taps are used in the majority of the buildings.

Table 6: Water Efficient Appliances Usage

Appliance	Total Number	Total number water Efficient appliances	Percentage
Faucet	1350	430	30%
Flush	550	250	45%
Spray taps	120	120	100%
		Average Percentage	**58%**

Figure 42: Water Efficient Appliances Usage

5.TRANSPORTATION

5.5. Shuttle Services

Sakarya University is served by local buses and minibusses run by the Sakarya Metropolitan Municipality. These busses serve as shuttle in the campus area. They do not take any charge from the individuals, they are free for the people who get into the bus after the bus entered in the campus area. This is also the same for the minibusses. There is no need for shuttle services instead.

Figure 43: Shuttle Services

Figure 44: Ring Road Signs

5.9. Zero Emission Vehicles (ZEV) Policy on Campus

In Sakarya University zero emission vehicles are available and provided by the university free. The students and staff can use the bicycles by giving their institutional ID cards to the officer. Also there are bike parking areas in all parking areas and also in front of several buildings where there is any car parking area but there is bike parking area. This efforts aim to create awareness about the advantages of using bicycle.

Figure 45: Campus Bikes

Figure 46: Bike Parking Areas

5.13. Ratio of Parking Area to Total Campus Area

Table 7: Total Parking Area

CAMPUSES	TOTAL AREA (in m²)	PARKING AREA (in m²)
MAIN CAMPUS	1600000	20.580,23
DENTISTRY	21.587,54	215,13
KORUCUK	390.584,24	801,97
HENDEK	11.067,58	307,44
HEALTH SERVICES	13.721,42	375,34
GRAND TOTAL	**2.036.960,78**	**22.280,11**

Ratio = 1 %

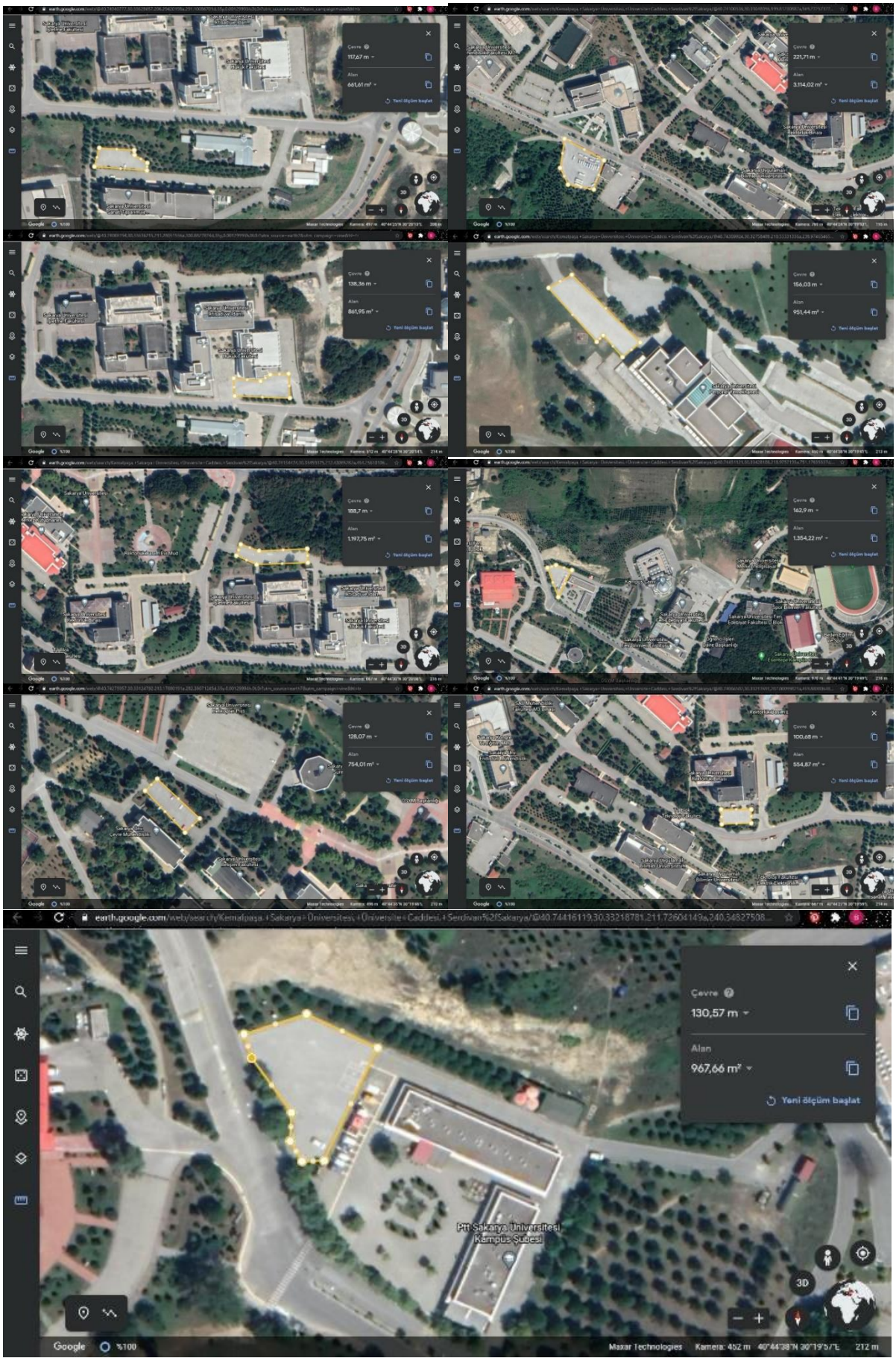


Figure 47: Parking Areas - Main Campus

Figure 48: Parking Area - Health Services Campus

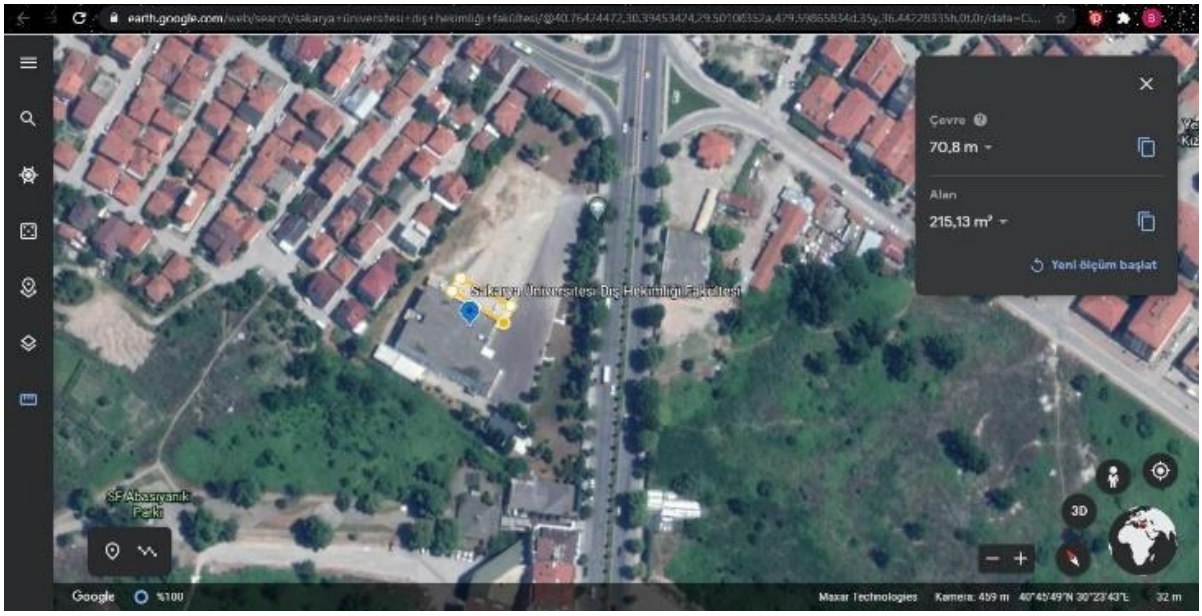


Figure 49: Parking Area - Dentistry Campus

Figure 50: Parking Area - Hendek Campus

Figure 51: Parking Area - Korucuk Campus

5.15. Number of Transportation Initiatives to Decrease Private Vehicles on Campus

There are four different transportation initiatives to decrease private vehicles on campus. First one is busses which are serving as shuttles inside the campus.

Figure 52: Shuttle Bus inside Campus

Instead of busses people may use minibusses which are serving as shuttles inside the campus.

Figure 53: Shuttle Minibus inside Campus

People may rent bicycles for free for transportation inside the campus.

Figure 54: Bikes for Rent

The last initiative is charging high banderole fees for vehicles and extra expensive bandrole fee for the second vehicle of the same person.

Figure 55: Banderole System

Additional link:
http://guvenlik.sakarya.edu.tr/tr/duyuru/goster/95582/bandrol

5.16. Pedestrian Path Policy on Campus

There are separators between road for vehicle and pedestrian path on campus.

Figure 56: Pedestrian Path - Road

Also there are pedestrian path for walking thorough the green area.

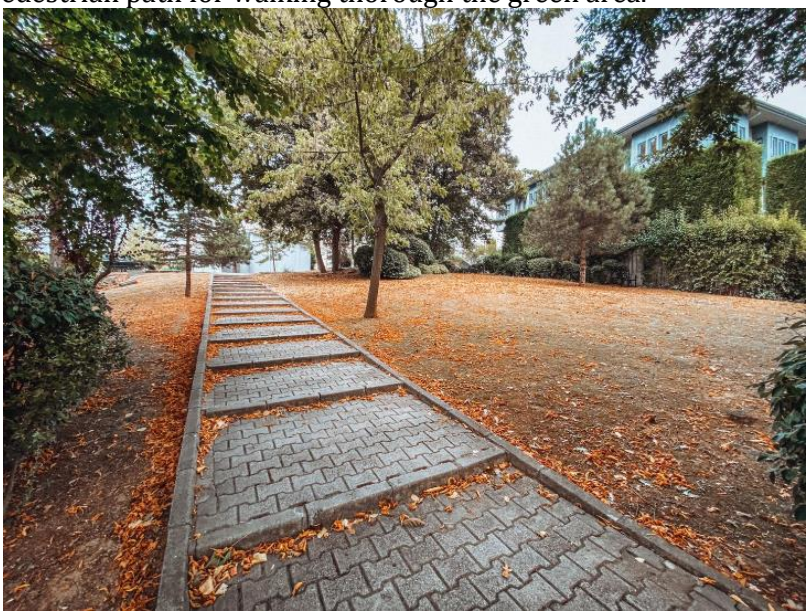


Figure 57: Pedestrian Path – Forest

There are ramps and guiding blocks which have suitable design for pedestrian having physical disabilities.

Figure 58: Path for Disabled Pedestrians

Figure 59: Solar Street Lamps

There are street lamps along the pedestrian paths. Solar street lamps, control the solar street lights automatically through the intensity of light.

6. EDUCATION & RESEARCH

6.1. Number of Courses/Subjects Related to Sustainability Offered

Below is a list of several courses offered to embed sustainability into curriculum content.

Total number of courses with sustainability embedded for courses running in 2019/20 is 497.

Table 8: Courses Related to Sustainability

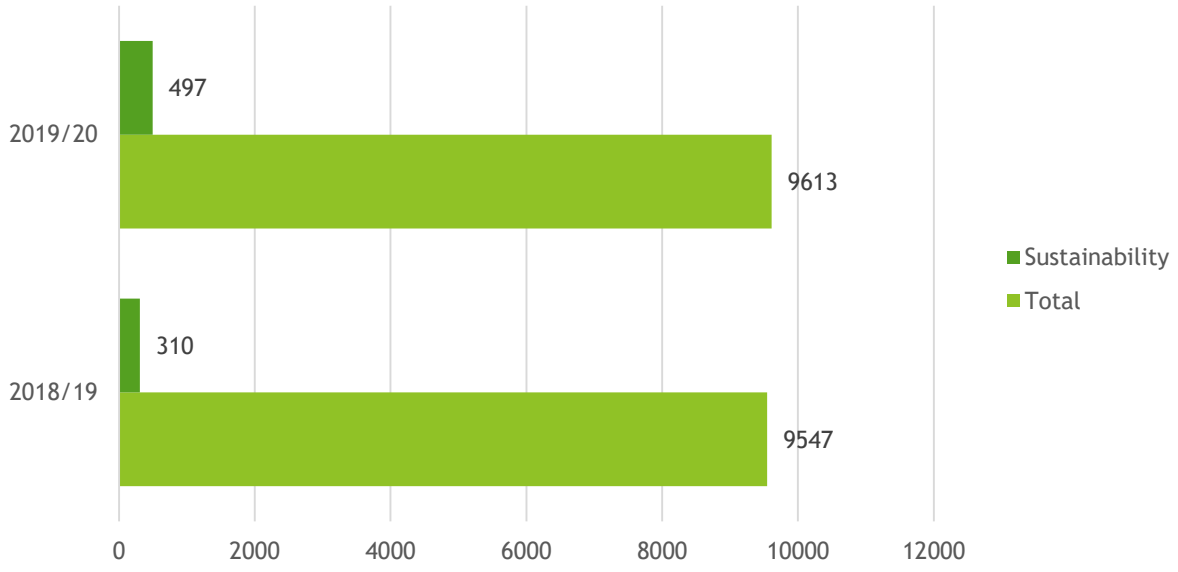
DEGREE	COURSE NAME	DEPARTMENT
BA	RECOVERY OF WASTES	ENVIRONMENTAL ENGINEERING
MA	WASTEWATER TREATMENT TECHNOLOGY	ENVIRONMENTAL ENGINEERING
BA	WASTEWATER ENGINEERING	ENVIRONMENTAL ENGINEERING
MA	HEAVY METAL POLLUTION IN WASTEWATERS AND REMOVAL.	ENVIRONMENTAL ENGINEERING
BA	WASTEWATER TREATMENT	ENVIRONMENTAL ENGINEERING
BA	COLLECTION AND REMOVAL OF WASTEWATER	ENVIRONMENTAL ENGINEERING
MA	ENERGY GENERATION FROM BIOMASS AND ORGANIC WASTES	ENVIRONMENTAL ENGINEERING
BA	WATER AND WASTEWATER TREATMENT APPLICATIONS IN ENVIRONMENTAL ENGINEERING (SECTOR COURSE)	ENVIRONMENTAL ENGINEERING
BA	INDUSTRIAL WASTEWATER CONTROL	ENVIRONMENTAL ENGINEERING
MA	ENERGY CONVERSION AND STORAGE MATERIALS	RENEWABLE ENERGY SYSTEMS
BA	DOMESTIC AND INDUSTRIAL WASTE MANAGEMENT (SECTOR)	ENVIRONMENTAL ENGINEERING
BA	WASTE AND BY-PRODUCTS IN THE FOOD INDUSTRY	FOOD ENGINEERING
MA	SOLAR ENERGY CONVERSION SYSTEMS	MECHATRONIC ENGINEERING
PhD	WATER AND WASTEWATER TREATMENT OF ADVANCED OXIDATION SYSTEMS	ENVIRONMENTAL ENGINEERING
BA	SOLID WASTE REGULAR STORAGE AREA DESIGN	ENVIRONMENTAL ENGINEERING
PhD	CONTROL OF SOLID WASTE LEAKAGE WATER	ENVIRONMENTAL ENGINEERING
BA	SOLID WASTES AND ITS CONTROL	ENVIRONMENTAL ENGINEERING
BA	CHEMICAL WASTES AND ENVIRONMENTAL POLLUTION	SCIENCE TEACHING PROGRAM
BA	GLOBAL CLIMATE CHANGE	ARCHITECTURE
MA	GLOBAL CLIMATE CHANGES	ENVIRONMENTAL ENGINEERING

BA	RECYCLING OF MATERIALS	METALLURGY AND MATERIALS ENGINEERING
BA	NUCLEAR FUEL TECHNOLOGY AND WASTE MANAGEMENT	PHYSICS
MA	BIOTECHNOLOGY APPLICATIONS IN WATER AND WASTEWATER TREATMENT	ENVIRONMENTAL ENGINEERING
BA	RECOVERY AND REUSE TECHNIQUES IN WATER AND WASTEWATER	ENVIRONMENTAL ENGINEERING
MA	SUSTAINABLE ENERGY AND CLIMATE CHANGE	RENEWABLE ENERGY SYSTEMS (INTERDISCIPLINARY)
MA	SUSTAINABLE ARCHITECTURE	ARCHITECTURE
MA	SUSTAINABLE BUILDINGS AND GREEN BUILDING TECHNOLOGY	CIVIL ENGINEERING
MA	IMPROVEMENT IN DANGEROUS WASTE AREAS	ENVIRONMENTAL ENGINEERING
BA	HAZARDOUS AND HARMFUL WASTES	ENVIRONMENTAL ENGINEERING
BA	MEDICAL WASTE MANAGEMENT	ANESTHESIA
MA	MEDICAL WASTES AND WASTE MANAGEMENT AND IMMUN DEFICIENCY	INFECTIOUS DISEASES
BA	RENEWABLE AND SUSTAINABLE ENERGY	ELECTRICAL-ELECTRONIC ENGINEERING
PhD	GREEN ECONOMY AND SUSTAINABLE SOCIAL POLICY	LABOR ECONOMY AND INDUSTRIAL RELATIONS

6.2. Total Number of Courses/Subjects Offered

Total number of courses offered in 2019/20 = 497 courses (not modules)
Ratio: 5 %

Table 9: Ratio of Courses Offered



6.4. Total Research Funds Dedicated to Sustainability Research

Total research fund dedicated to sustainability research in 2017 = 1480702 US Dollars
Total research fund dedicated to sustainability research in 2018= 1615800 US Dollars
Total research fund dedicated to sustainability research in 2019 = 1725806 US Dollars
The averaged annum last 3 years of research fund dedicated to sustainability research = 1607436 US Dollars

6.5. Total Research Funds

Total research fund in 2017 = 4047381 US Dollars
Total research fund in 2018 = 3405899 US Dollars
Total research fund in 2019 = 3264100 US Dollars
The averaged annum last 3 years of research fund = 3572460 US Dollars

6.8. Number of Events Related to Sustainability

Total number of sustainability/environment related events in:
2017/2018: 15
2018/2019: 32
2019/2020: 94
A total average per annum over the last 3 years of **47 events** (e.g. conferences, workshops, awareness raising, practical training, etc.).
Sakarya University Faculty of Engineering students produced an electric vehicle for two people that can reach 80 kilometers per hour with the engine they developed using only composite materials.
Sakarya University Energy Technologies Community (SETT) students have produced an environmentally friendly electric vehicle called “Generation V3”. In order to reduce the effects of various gases and wastes emitted to nature as a result of the combustion of petroleum and petroleum-derived fuels on the ecosystem, the trend towards alternative energy sources has gained great momentum in recent years.

Seminar series on environmental legislation were held at Sakarya University. Also student communities prepare shows, hiking and trekking activities, seminars and conferences by inviting expert from industry to create awareness on sustainability. Seminars on waste classification and disposal and initiatives for waste gathering are held continuously by several student comunities and faculties during the year.

Figure 60: Events Related to Sustainability