İZMİR INSTITUTE OF TECHNOLOGY

SUSTAINABILITY REPORT

2023

CONTEXT

OUR COMMITMENT

Our campus location is one-of-a-kind, with various natural, environmental, and historical values. We are proud to have a campus full of natural, historical and social assets. As IYTE members, we are dedicated to upholding these ideals and making our campus more sustainable, livable, and pleasant. We are also committed to developing and implementing effective measures that engage our students, coworkers, and stakeholders in the discourse about sustainability, resulting in significant change and improvements both locally and worldwide. Our efforts to protect and improve these assets are never-ending.

OUR CAMPUS

Our university is located in the Urla Region, within the borders of Izmir province, which is situated in the western region of Turkey. Our campus area is one of the largest in the country, covering a total area of 35.000.000 m². The campus area generally consists of gently sloping lands and plains, which are home to Mediterranean pine forests, maquis (Mediterranean shrub) areas with rich biodiversity, wetlands, and small and fertile plains. The region has typical Mediterranean climate characteristics. The summer months are dry and hot, while the winter months are warm and rainy.

Our campus has a microclimate with sunshine and light breezes all four seasons of the year. Our campus area has a perfect sea view and lands by the sea. In addition, there is a small waterfall, a stream with a high flow rate in winter months, and an alluvial plain within the campus area.

Approximately 28.000.000 m² of this large and beautiful campus is used for campus settlement. Our campus has a total of 52 buildings that meet sustainability criteria. It also features large open areas that increase social interaction and are suitable for climatic conditions, sports fields, roads with permeable surfaces, and car parks. Furthermore, we strive to preserve natural vegetation by growing climate-compatible plants in landscape areas.

OUR UNIVERSITY

IZTECH is an English-medium university that comprises three faculties: Science, Architecture, and Engineering. Our university provides education to 7343 students with a total of 1228 academic and administrative staff in undergraduate, master's and doctoral programs.

As a leading national research institute, IZTECH has a distinctive research ecosystem in Izmir. The campus area encompasses a Technology Development Zone, Technopark

SUSTAINABLE GREEN CAMPUS COORDINATION

The IZTECH Sustainable Green Campus Coordinatorship was founded in 2014. A search conference for a sustainable living campus with the tagline “happy campus” was held with the campus actors’ collective participation. However, it was not until December 2019 that a Framework on Sustainable Campus was defined.

IZTECH has decided to apply the UI GreenMetric for critical self-evaluation and development in the field of sustainability in 2020 and continued to do so in 2021 and 2022 as well. With the motto of “happy campus, happy peninsula, happy Izmir,” the IZTECH Sustainable Green Campus Coordination group was formed. It consists of 12 academics including our rector, our academicians who are expert in the field and young and enthusiastic teaching assistants. Most importantly, our Coordinatorship continues today thanks to the support of eco motion and numerous other student communities. As a result, we are able to assure the sustainability of our campus through bottom-up development.

OUR SUSTAINABILITY THEMES

THREE PILLARS of SUSTAINABILITY: In terms of education, research, and societal benefit, IZTECH adopts economic, social, and ecological sustainability as the guiding concept, and aims to ensure that all assets on the IZTECH campus exist in a sustainable environment.

SUSTAINABLE DEVELOPMENT: IZTECH considers it a duty to contribute to the development of persons who care about the planet’s sustainable future and are aware of the threat to society and the environment, beginning with its own campus and near surrounds, and to raise awareness on this problem.

USE of RESOURCES: IZTECH monitors and archives resource utilization values, distributes them with campus stakeholders and the public on a regular basis, and implements the necessary actions for ongoing development.

https://sdgs.un.org/goals

EDUCATION and RESEARCH: IZTECH redefines its campus as a sustainable, living, and nature-friendly “education-research ecosystem” that addresses the long-term viability of natural and cultural assets. It operates on the premise that all components of this ecosystem are equal.

GOVERNANCE: IZTECH is committed to developing its corporate governance, corporate culture, and organizational capability through a participative framework, as well as to ensuring the campus’s quality of life.

VISION: IZTECH’s operations continue with the objective of a worldwide sustainable future, by expanding its institutional and cooperative infrastructure on a national and international scale, through its campus, local surrounds, and the city of Izmir.

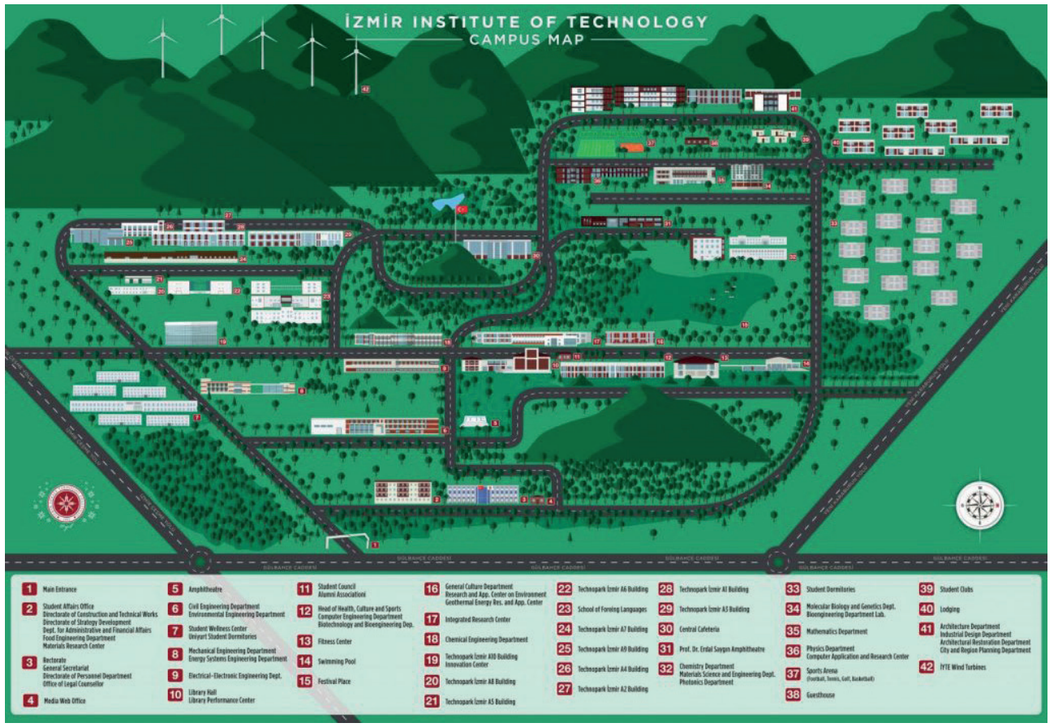
OUR 2023 PROGRESS in SUSTAINABILITY

In every way, 2023 was a very successful year for IYTE. All of our efforts to serve society and science strive to make the planet a better habitable place for future generations. Many significant initiatives have been carried out in the past years to ensure the sustainability of campus life. These efforts may be evaluated along the axes of infrastructure, energy, waste, water, transportation, education, and research.

We have undertaken significant renovation and repair work to ensure a long-term infrastructure. We made extensive use of the significant percentage of the campus budget for this purpose. Some of the work we conduct in this axis includes promoting the health of open areas, fostering social interactions, accessibility, and finding solutions for the disabled. Among our significant infrastructure projects are the expansion of health infrastructure and the construction of an ambulance center. On the other hand, we created or participated in a number of scientific research and organizations to document and safeguard the campus's natural values.

Our most remarkable accomplishment in sustainability last term was achieving a positive energy campus. We are proud of our wind power plants, which started operating recently and generate more energy than we use. We also reduced our energy consumption per person by installing smart building systems in all campus buildings.

Another aspect of our sustainability efforts is waste management. We pipe our wastewater to the closest treatment plant (38.31248,26.64267), run by the Izmir Metropolitan Municipality Water and Wastewater Treatment Directorate (IZSU). The plant uses an activated sludge process to remove carbon and nitrogen from the water. We tested the treated water at our labs and found it suitable for watering our olive trees. We requested permission from IZSU to use the recycled water and signed a protocol with them. We agreed to disinfect the water further before pumping it to a tank on a hill in the campus. We monitor the quality of the irrigation water regularly at our labs. Since IZTECH is in a semi-arid area, we need more water for our plants in summer. Using recycled wastewater instead of freshwater saves us about 64% of our water demand.



We also improved our collection and recycling of organic and other types of waste. We conducted waste characterization studies and obtained the “Zero Waste Certificate” from the Ministry of Environment, Urbanization, and Climate Change on December 12, 2022.

We have achieved water management and preservation by various methods. We have installed photocell taps and other devices in buildings to reduce water consumption. We have also used treated water for most of the landscape irrigation, saving freshwater resources. Besides these conventional measures, we have initiated innovative projects to regulate our water use and adapt it to the climate. These include the Surface Runoff Pooling Project, the Rainwater Harvesting Project, and the Bioswale Project, developed by our institute’s academics. Moreover, we have protected the streams and groundwater resources within the campus area by limiting construction around them.

We have also promoted sustainable transportation by encouraging walking and cycling on campus. We have collaborated with local governments to improve public transportation services in terms of frequency and quality. We have also enhanced the quality of on-campus transportation by increasing our shuttle services. In the field of education and research, we have witnessed a significant increase in the number of publications and projects on sustainability topics. Our university has managed to publish more papers in international peer-reviewed journals and to secure major international projects. We have also introduced new courses on sustainability and incorporated sustainability themes into existing courses. For example, we have developed the CHE Global Sustainable Development and HUM261 Global Sustainability courses to enhance teaching and research activities on sustainability issues.

These courses are designed to discuss the Sustainable Development Goals (SDGs) week by week with experts who have a critical perspective. Students are expected to work in groups on their chosen SDG and create an activity-based project that aims to raise public awareness. More than 150 students have taken these courses so far, and the change in their approach was visible from the word cloud generated at the end of class. We aim to convey the concept of sustainability to a wide range of students and various organizations through such courses and other workshops and activities.

In addition to these actions taken mentioned above, IZTECH has implemented a data collection system during the recent term to raise awareness of the Sustainability Development Goals among all campus stakeholders. The system encourages discussions on different aspects of sustainability and requires the organizer of each activity to define its contribution to IZTECH's strategic axes, namely, Research, Teaching, Leading by Action, and Public Engagement. The organizer can be academic staff, students, administrative staff, public actors, etc., while the activity defines a broad area from offered courses to public panels, from academic meetings to sports and cultural events.

1- Setting & Infrastructure

IZTECH is continuously striving for improvement in the first category, “Setting and Infrastructure”. In recent years, the efforts in this aspect have multiplied, with significant progress being made compared to previous years, particularly in certain areas through various projects and investments. Our institute owns 35.000.000 m2 of land and approximately 28.140.000 m2 of which is currently dedicated to education and research for 7343 regular students and 1228 academic and administrative staff. Amongst this area, total forest area corresponds to 25520852 m2, whereas total planted vegetation area is 2861217 m2 with a percentage of 10.16% with respect to the total area. İzmir has goals to be a sponge city and in this context, IZTECH gives extra attention on the water absorption. It is common in IZTECH to build green roofs, parks, sidewalks, etc with water absorption ability. IZTECH separates considerable amount of its budget to the activities related to sustainability including:

- staff services for mass transportation to reduce the CO2 emission and to reduce private vehicles in the campus
- the fuel and maintenance of these service buses
- daily meal expenses of the students and the staff
- better accessibility for disabled people
- continuous dormitory construction as a result of which there is no undergraduate student in IZTECH who has demanded a dormitory accommodation, and we couldn’t provide extension of significant number of study rooms which are mostly open till midnight, where most of the labs are also modified in terms of involving study rooms for the students
- IZTECH buildings are continuously improved for a better heat isolation and, significant amount of budget is reserved for the assessment of seismic behaviour of the existing campus buildings, and if necessary to retrofit them, as well as routine building maintenance activities. There is no campus building which has not taken any sort of these services.

At the beginning of 2023, IZTECH had an aim to fully implement all facilities within the campus for disable and maternity care. We carefully identified the deficiencies we observed in previous years in this context and allocated a significant budget to address them within this year. We can proudly say that there is no building within our campus that poses challenges in terms of disabled, special needs, and/or maternity care. A summary of activities is listed below and visualised in Figure 1.

- Tactile warning surfaces and non-slip tape installations were carried out inside and outside of all buildings in the campus
- All buildings in the campus have accessible ramps
- Protective curbs were added to the edges of the ramps
- Directional signage was installed inside and outside, and Braille was added to door nameplates, positioned at the height compliant with TS 9111, for all buildings

- An audible floor information system was installed for the existing accessible elevators, providing audible information inside and outside
- Directions were provided to accessible toilets and the elevators
- The interior stair handrails were revised to comply with the standards
- The undersides of the stairs were closed to provide a minimum height of 220 cm
- Accessible toilets were arranged to comply with the standards
- Braille alphabet information and warning signs were applied to the elevators
- An induction loop system was installed in the elevators
- Pull cord and presence sensor systems were added to the accessible toilets
- Installation of voice evacuation system devices for emergency exits was carried out

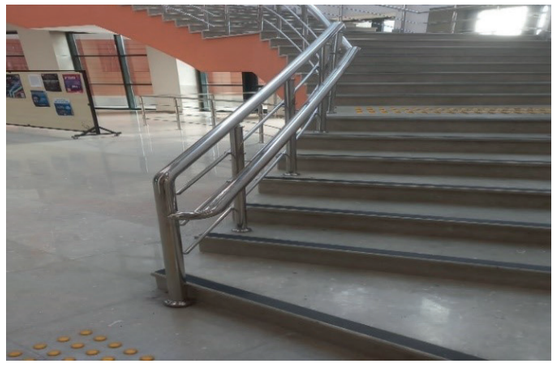



Figure 1. Views from activities in IZTECH for disabled people

Security infrastructure is fully available and operational in our campus. Our campus has 3 entrance and each of them are controlled by the security and camera systems. Students enter the campus by using their student cards. Entrance of each building in the campus as well as critical parts of the campus are recorded by the security cameras. We have our own Fire Engine which is fully equipped always ready for intervention. Every building has a smart fire alarm system, several fire extinguishers in every floor, an integrated fire hose through the walls as well as a large fire hydrant outside the buildings. A fully equipped ambulance and an ambulance station building has been donated to IZTECH recently by two philanthropists, which is going to be delivered in a couple of weeks as of the submission date of this report. With well-educated security staff and fully operational modern security systems, its own fire engine and its own ambulance station located in the campus, the security responding time for accident, crime, fire, and natural disaster is considerably less than 5 minutes in IZTECH campus.




Figure 2. Views from precautions on security and safety in IZTECH

In IZTECH, we have a clinic in the campus with capability of providing first aid, emergency room, and certified health personnel including nurses and medical doctors. The clinic has capability to perform dental examination and treatment, vaccination, emergency service and laboratory.

We also care about conservation of plant, animal, and wildlife, genetic resources for food and agriculture and we secure them in conservation facilities. We have two greenhouses on campus, which are used for plant science research activities and ornamental plant propagation for campus landscape gardening. The research activities are conducted by the Izmir Institute of Technology Plant Science Application and Research Center. The main scope of interest for that center is conducting research related to plant genetics and biotechnology. The Izmir Institute of Technology Plant Science Application and Research Center currently conducts several research projects in relation to the conservation of local agriculturally significant plants in Turkey, including fig and salep orchids. In addition, biodiversity in the forests of our campus is being investigated for academic purposes. Some examples related to the fully implemented conservation plan of IZTECH have been presented in the photos visually below.

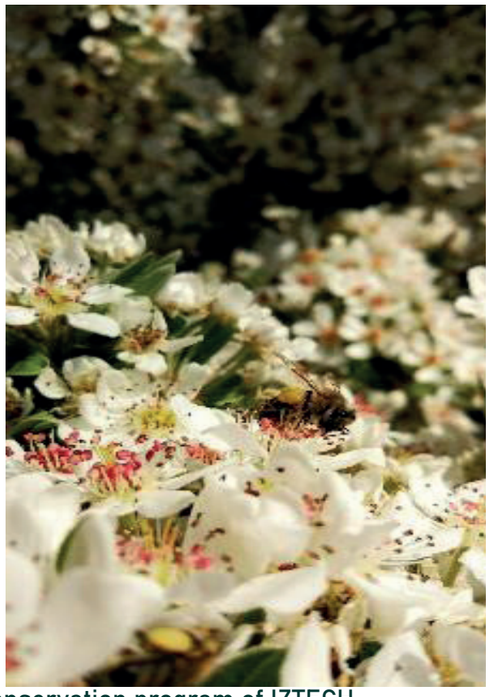
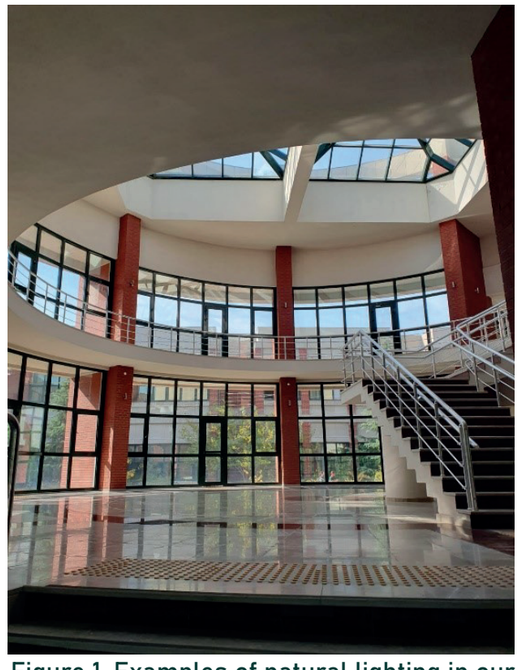


Figure 3. Some views from fully implemented conservation program of IZTECH

2- Energy & Climate

IZTECH works for the improvement in energy efficiency, production of renewable energy and energy consumption reduction thus decreasing greenhouse gas emissions. At the IZTECH campus, energy efficient appliances are used in most of the buildings. LED light bulbs, light bulbs with motion sensor, energy efficient air conditioner systems are some of the approaches to reduce the consumption. Most of the buildings have natural lighting and ventilation.



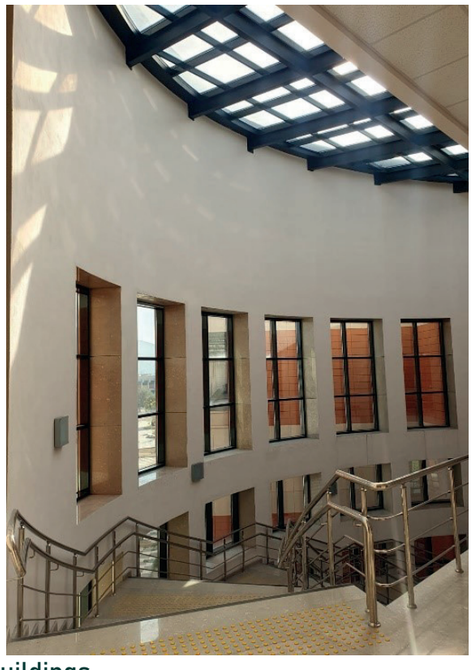


Figure 1. Examples of natural lighting in our buildings.

Solar panels and wind turbines are actively working at the campus. Electricity is being generated by solar panels on roofs of some buildings as well as the swimming pool is being heated by the solar power. Wind turbines with 13.5 MW capacity generated 5 times more electricity than the electricity used at the campus. The generated electricity is given to the city hub. IZTECH has reached a positive value on the impact with the last improvements in renewable energy approaches.

Figure 2. Solar panels and wind turbines at our campus.

The Gulbahce region has a very high sunshine duration during the year. Greenhouse gas emission reduction is considered from different scopes such as e-vehicles managed by the university, bicycles in the campus, waste sorting bins (metal, plastic, paper, glass, batteries and rest), wastewater treatment and usage, renewable energy sources (wind and solar) and drinkable water fountains.

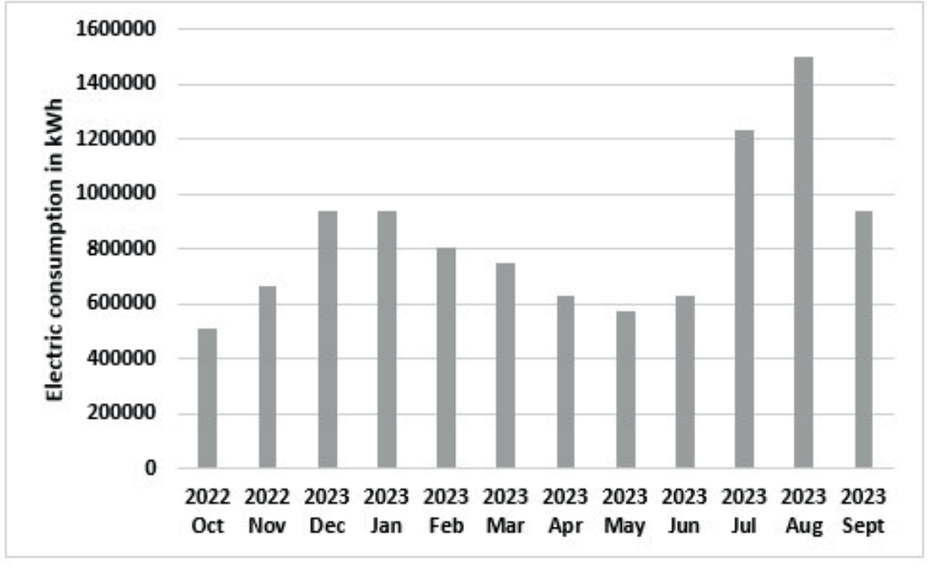


Figure 3. Electricity consumption of IZTECH campus in last 12 months

IZTECH is a part of project called Development of Advanced Composite Pressure Vessels for Hydrogen Storage including on-site testing of new hydrogen storage unit. Efficient storage of hydrogen is crucial for the success of emerging hydrogen energy markets & is strongly connected to the performance & safety of the components of the supply chain. Currently, hydrogen is stored & transported in a compressed form to satisfy the safety & weight regulations for high pressure gases. Alternatively, composite storage vessels offering high strength & low weight addresses this largely unmet problem with a multi-disciplinary team that aims at developing cost-competitive lightweight composite cylinders with improved mechanical & barrier properties for hydrogen storage using the additive manufacturing technology. Such 3D printed liners with barrier coatings make them impermeable to gases. Further, novel chemo-chromic material-based sensors will be developed & integrated into these structures for real-time monitoring of the diffusion of gas.

The 3D printed hydrogen storage vessels will be integrated to the wind hybrid system (wind turbine, PV unit, battery system)and will be tested on the site to evaluate their performance.

IZTECH is a part of project titled Green Hydrogen Generation Energized with Innovative Small Scale Wind Turbine which is a part of the Green and Blue Transformation Program, with assistance from the İzmir development agency.

This project aims to domestically produce the electrolyzer, one of the most important components of green hydrogen production, which has an increasing demand both domestically and abroad. Within the scope of this project, a 2 kW level module will be created, which has not yet been produced locally in our country. Design parameters that will maximize operating efficiency will be tested in both single-cell and multi-cell structures. These parameters include many components such as precious metal loading rate for the anode and cathode separately, catalyst material type, array design, dimensions, operating voltage, squeezing pressure, feed water purity and temperature, cooling load.

On the other hand, the production of hydrogen produced with an electrolyzer powered by renewable energy sources, based on domestic and national technologies, is also very important in terms of the green hydrogen concept. This project will allow the production of hydrogen, one of the strategic energy carriers of the future, through an electrolyzer developed with national engineering, energized by a vertical axis wind turbine developed with national technologies.

Figure 4: The vertical axis wind turbine used in the project

3- Waste

The performance of IZTECH at waste management was evaluated according to the data collected on several aspects: (1) rate of recycling program applied to university waste, (2) number of programs to reduce the use of paper and plastic on campus, (3) rate of organic waste treatment, (4) rate of inorganic waste treatment, (5) rate of toxic waste treatment, and (6) the means of sewage disposal.

1.1. Recycling Program:

In Turkey, the Zero Waste Project (http://zerowaste.gov.tr) is in effect. IZTECH received the "Zero Waste Certificate" from the Ministry Of Environment, Urbanization, and Climate Change on December 12, 2022.

"When a university receives a "zero waste certificate," it generally indicates that the university is implementing waste management in accordance with zero waste principles and meets certain criteria. The zero-waste certificate demonstrates that an institution manages its waste by reducing, reusing, recycling, and recovering, aiming to minimize waste generation. Universities that receive this certificate:

Environmental Awareness: The university strives to instill zero waste principles in students, academics, and staff by increasing environmental responsibility awareness.

Waste Management: The university collects, segregates, and recycles its waste properly. This prevents waste from harming the environment.

Economic Benefit: There is an economic income from the sale of materials obtained through recycling. By means of this certificate, IZTECH can sell its own recyclable waste.

Sustainability: Zero waste principles support a sustainable environmental management approach.

Positive Image: The zero waste certificate is considered a prestige element, showing that the university fulfills its environmental responsibilities.

The certificate officially defines and encourages the university's commitments and achievements in environmental sustainability. IZTECH implemented a system that informs everyone on campus about what is recyclable and what is not. The Waste Commission of IZTECH is responsible for structuring the rules and executing the collection of specific waste (Electronic Waste (e-waste), batteries, and ink cartridges from printers. E-waste items are collected separately and not disposed of in regular trash bins) (Figure 4.1).

Figure 1. Recycling Program for IZTECH, Turkey

For the Recycling Program at IZTECH Campus

Based on the provided image, the recycling program for the university is divided into items that are recyclable and items that should not be placed in the recycling bins. The university provides continuous education on these guidelines to ensure that everyone on campus is well-informed and practices proper recycling habits.

Recyclables:

- **Paper:** This category includes items like newspapers, magazines, loose paper, and probably any non-laminated paper products.
- **Cardboard:** This refers to materials like cardboard boxes or carton packages.
- **Plastic:** This encompasses items made of plastic, such as bottles, containers, and other plastic products.
- **Metal:** This category includes metal items, especially drink cans, which seem to be prominently displayed.

Not Here: These are items that should not be placed in the recycling bins:

- Wet tissues: Used wet wipes or tissues.
- Fruit peels: The skins or peels from fruits.
- Glass: This refers to items made of glass like bottles or jars.
- Batteries: Used or spent batteries.
- Tea-coffee waste: The remnants of brewed tea or coffee.

By regularly educating its members, the university aims to promote a more sustainable environment on campus and ensure effective recycling while minimizing contamination. Proper sorting and recycling practices are crucial for reducing waste and conserving resources.

Sustainability aims to use the energy sources of the world in a way that meets the present and future needs of humanity. It involves making conscious choices to reduce waste generation and decrease the adverse impacts on the environment. Recycling, reusing, and recovering activities play a crucial role in sustainability efforts.

Understanding waste characterization is essential for promoting sustainability. By analyzing the composition of waste, we can identify valuable opportunities for recycling, reuse, and waste reduction. This knowledge enables us to develop targeted strategies and technologies to minimize environmental impact and construct a sustainable economy.

Within this framework, separate waste collection plays a critical role. Individual efforts in society are crucial for reducing the amount of waste sent to landfills. Separate collection of the wastes in accordance with their types at where that waste is generated (houses, workplaces, public places, etc.; can be defined as “source”) allows for the efficient sorting and processing of different types of waste, making it easier to recycle and reuse materials. This helps to minimize the need for raw material extraction and reduces the energy consumption.

In this regard, a waste characterization study was conducted at our institute to promote awareness of the separation of the waste at its source and identify the sustainability potential of the waste generated within the campus. As part of this study, samples were collected from the lecture halls and library during term time (14-20 January) and holidays (21-27 January) (Figure 4.2); on weekdays and weekends, to determine the waste composition (Figure 4.3). Thanks to the intensive work carried out by the faculty members of the Environmental Engineering Department of IZTECH for two weeks, data regarding the content of our institute’s waste has been obtained, revealing its potential for recycling and recovery.

Figure 2. Waste Characterization Study at IZTECH Campus

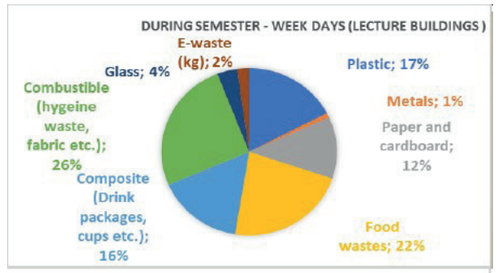


Figure 3. Waste Characterization Results

1.2. Reduction of Paper and Plastic On Campus:

As a prominent state university, IZTECH has seamlessly integrated the Electronic Document Management System into its administrative operations. This system, mandated by a government decree, has been uniformly adopted across all state offices, ensuring a streamlined and efficient digital workflow. This not only enhances operational efficiency but also aligns IZTECH with the broader governmental vision of modernized administration.

In a commendable move towards environmental sustainability, IZTECH has strategically installed numerous drinking water fountains throughout the campus. These fountains are designed to offer free, clean drinking water to everyone, be it students, staff, or visitors (Figure 4.4). This initiative not only promotes hydration but also significantly curtails the reliance on plastic bottles, thereby contributing to a reduction in plastic waste.

Demonstrating its commitment to sustainability right from the outset, IZTECH has taken the initiative to distribute reusable glass water bottles to incoming students during their orientation. This gesture not only welcomes them but also instills a sense of environmental responsibility. By providing these bottles, the university aims to diminish the usage of single-use plastics, fostering a culture of reuse and sustainability among the student body.

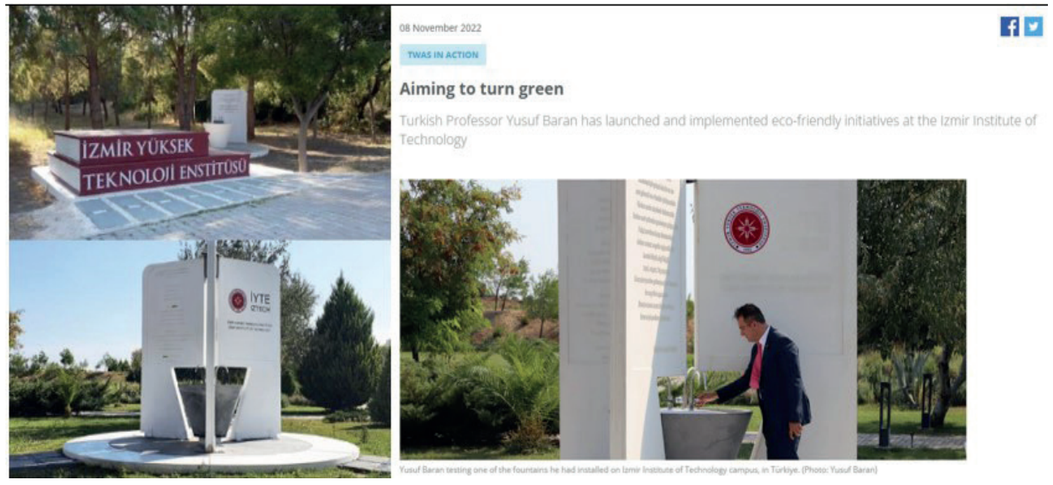


Figure 4. Several drinking water fountains were built throughout the campus in order to reduce single-use plastic bottle consumption.

Further amplifying its eco-conscious efforts, IZTECH actively promotes the reuse of plastic bags on campus. This initiative is in sync with a broader national movement aimed at reducing plastic waste. As a testament to the seriousness of this endeavor, what were once freely available single-use plastic bags are now priced at 0.25 TRY per bag. This nominal fee serves as both a deterrent to excessive use and a reminder of the environmental costs associated with disposable plastics.

1.1. Organic Waste Treatment:

Within the IZTECH campus, systematic waste management practices are implemented, especially concerning organic waste. The table sheds light on how different types of organic waste are treated and processed.

Total Organic Waste: Out of the total 245 tons of organic waste, none is reused. However, 60 tons are recycled, with the remaining 185 tons sent to sanitary landfill disposal.

Food Waste from Cafeteria: The cafeteria, one of the primary generators of organic waste, produces 95 tons. While 25 tons of this waste are recycled, 70 tons are directed toward sanitary landfill disposal.

Organic Waste Collected from Buildings: This category, accounting for 115 tons, is significant. Notably, none of this waste is either reused or recycled, with all of it (115 tons) being sent for sanitary landfill disposal.

Garden Waste: The campus produces 35 tons of garden-related waste. In a commendable effort towards sustainability, all of this waste (35 tons) is recycled and none of it reaches the landfill.

Remaining organic waste produced after recycling on campus is collected by Izmir Metropolitan Municipality's garbage trucks and is transported to a transfer station and then to Harmandalı Landfill Area, where it is landfilled according to health and safety regulations. The Harmandali Landfill Area, where a biogas production facility is is also managed by Izmir Metropolitan Municipality. IZTECH is bound by national legislations to give its organic waste to the municipality so that it can be disposed safely and according to the national law (Figure 4.5).

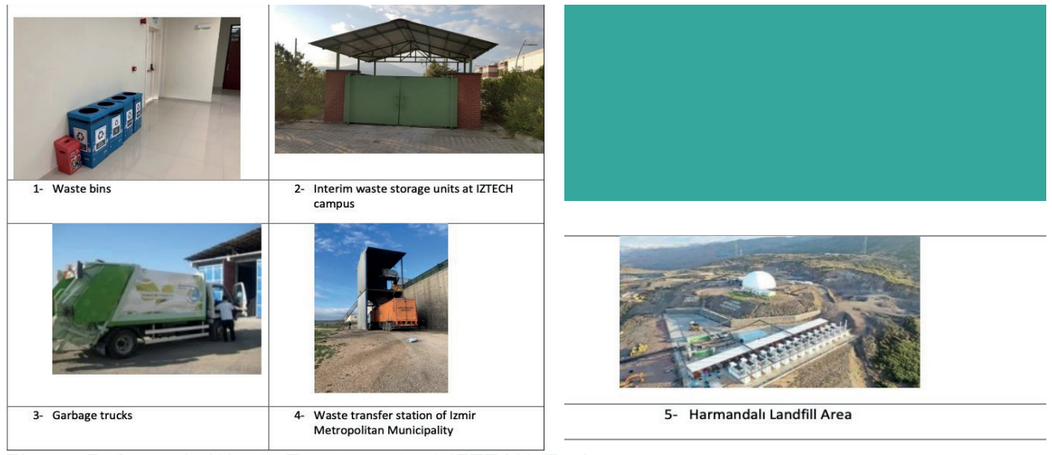


Figure 5. Organic Waste Treatment at IZTECH, Turkey

1.4. Inorganic Waste Treatment:

Inorganic Non-toxic Waste: A total of 260.9 tons was produced. All 260.9 tons of it was down-cycled, by means of Zero-Waste Certificate the inorganic wastes are given to licensed firms that specialize in waste management and recycling.

- Aluminum Cans: The campus generated 16.3 tons. The entire 16.3 tons was down-cycled, by means of Zero-Waste Certificate the inorganic wastes are given to licensed firms that specialize in waste management and recycling.

- Soft Plastic: Soft plastic constituted a significant portion with 138.5 tons. All 138.5 tons was down-cycled, by means of Zero-Waste Certificate the inorganic wastes are given to licensed firms that specialize in waste management and recycling.

- Hard Plastic: 24.6 tons of hard plastic waste were produced. The complete 24.6 tons was subjected to down-cycling, by means of Zero-Waste Certificate the inorganic wastes are given to licensed firms that specialize in waste management and recycling.

- Paper/Cardboard: The production of paper and cardboard waste totaled 81.5 tons. The entire 81.5 tons was down-cycled, by means of Zero-Waste Certificate the inorganic wastes are given to licensed firms that specialize in waste management and recycling.

All recyclable waste produced on the campus is diligently collected and handed over to licensed firms that specialize in waste management and recycling (Figure 4.6). These firms are accredited and operate under strict guidelines and standards, ensuring that the waste is processed in an environmentally friendly and sustainable manner. Collaborating with such licensed entities not only helps the campus adhere to waste management regulations but also significantly contributes to its commitment to environmental responsibility and conservation. The partnership with these firms underscores the campus's dedication to sustainable practices and its effort to minimize its ecological footprint.

Figure 6. Inorganic Waste Treatment at IZTECH, Turkey.

1.5. Toxic Waste Treatment:

This comprehensive process reflects the institute's commitment to responsible waste management, ensuring that hazardous materials are handled with the utmost care and professionalism.

The flowchart illustrates the management process of toxic waste at the institute (Figure 4.7):

- Hazardous Wastes from Laboratories: Initially, hazardous wastes are generated in the laboratories.
- Laboratory Chemicals: These wastes mainly consist of laboratory chemicals which require special handling.
- Coordinated Waste Packages: The next step involves consolidating these wastes into coordinated waste packages, ensuring that they are sorted and packed according to guidelines to maintain safety.
- Chemical Waste Storage (Transport): These coordinated packages are then transported to a dedicated chemical waste storage area, where they await further action. The transport aspect is emphasized to indicate the safe movement of these chemicals.
- Exterior Waste Container (with Yellow bags): As part of the final containment process before disposal or treatment, these wastes are placed in an exterior waste container. Notably, these containers use yellow bags, possibly indicating the hazardous nature of the contents or adhering to a specific waste coding system.
- Licensed Firm (Recycler): Once the waste is securely packed, a licensed firm, specializing in recycling or treating such wastes, takes custody of the waste.
- Delivery: The waste is then delivered to its final destination, whether that is a recycling facility, a treatment plant, or another appropriate location.
- Waste Supervisor: A dedicated waste supervisor oversees the entire process, ensuring that all protocols are followed and that the waste is managed efficiently and safely.
- Declaration: As part of compliance and record-keeping, a declaration is made, detailing the nature, quantity, and management processes the waste underwent.
- Waste Management Coordinator of the Institute: Ultimately, the Waste Management Coordinator of the institute is responsible for the entire system, ensuring that the waste is managed in accordance with regulations and best practices.

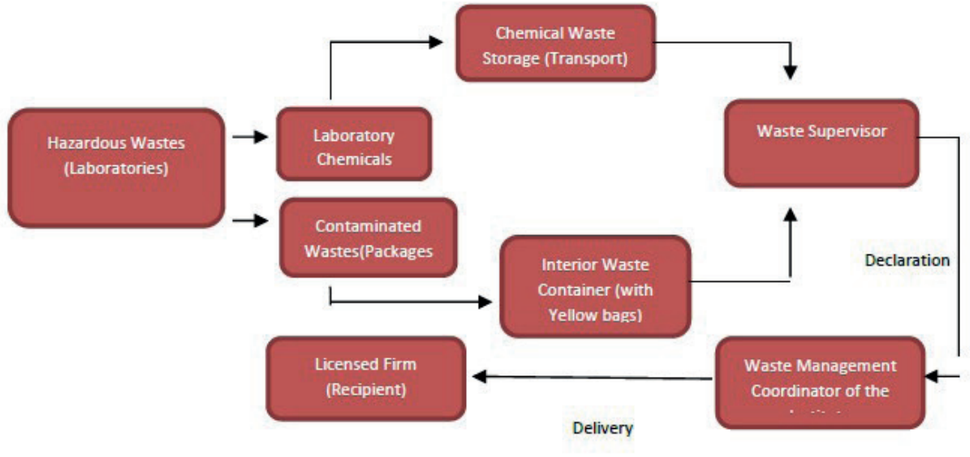


Figure 7. Hazardous Waste Management at IZTECH

At IZTECH, a dedicated individual is responsible for guiding both lab staff and students on the proper handling and management of toxic and hazardous waste within laboratory settings. This proactive approach ensures that everyone is well-informed about safety protocols and waste disposal methods.

To facilitate this, temporary storage rooms within the buildings are designated for the accumulation of such wastes, providing a centralized location for their safe containment. Annually, the Waste Commission undertakes a meticulous process of gathering data concerning the nature and volume of the waste generated. This data collection is pivotal as it informs the subsequent steps. After a comprehensive assessment of the accumulated waste, the commission solicits quotations from certified waste transport and disposal entities. The primary criteria for selecting a service provider are the quality of service they offer and the economic feasibility of their quote. Once a decision is made, the chosen company is invited to the campus for the collection and proper disposal of all hazardous and toxic waste. Furthermore, in a triennial routine, the fuel tanks on the campus undergo a thorough cleaning to eliminate any toxic fuel residues. This is not only a measure to ensure the operational efficiency of the tanks but also a crucial step in environmental protection. The details of this waste, including its type and quantity, are meticulously recorded, and then integrated into a national database. Ensuring transparency and adherence to national standards, the extracted toxic fuel waste is then dispatched to licensed incineration facilities for safe and environmentally responsible disposal (Figure 4.8).

Images from the toxic waste collection day

Refrigerated interim toxic waste storage at IZTECH campus.

Figure 8. Toxic waste management at IZTECH, Türkiye.

1.6. Sewage Disposal:

At the IZTECH campus, an advanced sewage collection system is in place, which employs a network of closed pipes to channel wastewater (Figure 4.9). This system efficiently directs the sewage to the dedicated IZTECH Wastewater Treatment Plant. The responsibility for the management and operation of this plant lies with the İzmir Metropolitan Municipality (IzMM) Water Directorate. Their operations strictly adhere to all the essential sanitary guidelines and regulations, ensuring that the treatment process is both effective and safe.

Designed with a capacity to treat a considerable 2000 m3 of wastewater per day, the treatment facility harnesses the power of the activated sludge system.

This particular system is known for its efficiency in breaking down and treating contaminants in the wastewater. However, prior to 2020, there were some challenges with the treated water's quality. The water, post-treatment, did not align with the national standards set for irrigation purposes. Recognizing this shortfall, the IZTECH Rectorate took the proactive step of officially reaching out to the IzMM Water Directorate in 2020. Their objective was clear: to introduce a disinfection unit into the wastewater treatment process. This would ensure that the effluent stream, post-treatment, would be of a quality suitable for irrigation.

Post the successful integration of the disinfection unit in 2020, a significant transformation was observed in the treated wastewater's quality. Now, this water is channeled to a storage facility situated at a higher elevation within the IZTECH campus. This strategic placement facilitates the easy distribution of this treated water for irrigating the campus's vast green spaces.

The adoption of this system has made it possible for IZTECH to efficiently use its treated wastewater for irrigation. In essence, this approach is a form of downcycling, where wastewater, instead of being discarded, is treated and repurposed for beneficial uses. This sustainable practice not only conserves water but also highlights IZTECH's commitment to environmental responsibility and resource management.

1- IZTECH wastewater treatment plant (WWTP).

2- IZTECH WWTP is nearby the IZTECH campus.

3- Official agreement between İzmir Metropolitan Municipality Water and Wastewater Directorate and IZTECH for reuse of treated wastewater.

Figure 9. Sewage treatment and reuse at IZTECH, Turkey.

4- Water

Located in a water-stressed region, IZTECH is dedicated to efforts in water conservation and water recycling/reuse. The water axis has been a critical focus and improved domain in terms of research, education, leadership, and public outreach at the IZTECH campus. As a leading research university in Turkey, IZTECH commits to become an exemplary community and to conduct educational outreach activities on the topics of water conservation, efficiency, and recycling. IZTECH has launched several projects in the water conservation field in recent years. The aim of conserving 70% of the water on the campus grounds was achieved with a collective effort by different stakeholders on the campus with the leadership pf the IZTECH Rectorate. Examples are given from the ongoing practices and newly launched projects for the reporting year.

1.1. Water Conservation Program:

Surface Runoff Pooling Project

İzmir Institute of Technology is located very close to the coastline of the Aegean Sea at the city of İzmir (1). A closer look at the campus topography reveals that the altitude change within the campus area is quite steep at various locations. There are 460 m high hills 3.5 km away from the Rectorate Building and as we get closer the altitude declines to 260 m high hills 1.75 km away from the Rectorate building. The Rectorate building is located at 51 m from sea level (2). As expected, in the incidence of rain, the water that cannot infiltrate the soil tends to run off from the surface and flows into the sea.

Therefore, IZTECH Rectorate has launched the Surface Runoff Pooling Project. The idea behind the first one was to hold the excess water that is coming from the higher altitudes of the campus through a steep slope, through olive tree orchards that were planted in the first place to minimize erosion. For this purpose, a 1.5 m deep pond was built near the Main Cafeteria area, so that flooding events were prevented in the case of heavy rainstorms, for which the frequency has increased due to the effects of climate change (3-4). The bottom of the pond was implemented with a natural filtration system that was composed of sand, fine gravel, and coarse gravel. The water levels in the pond reach approximately 1.4 m in the case of heavy rains, with levels gradually decreasing in the dry season. The pond also serves as a safe water source for the wildlife on our campus.

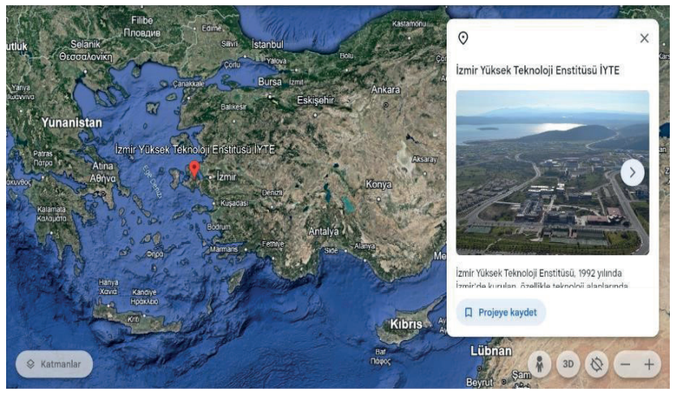


Figure 1.

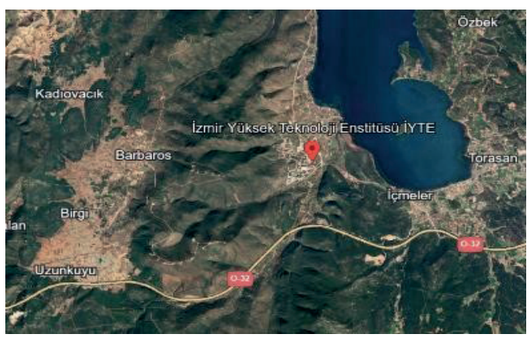


Figure 2.

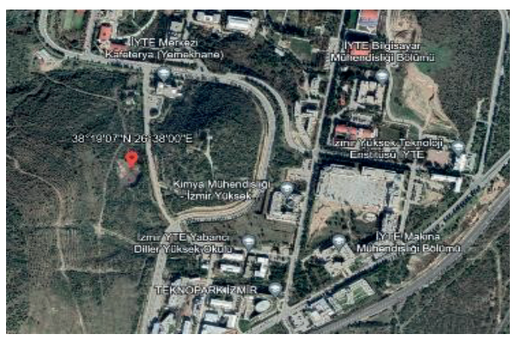


Figure 3.

Figure 4.

Groundwater Recharge Project

Facilitating groundwater recharge project idea has emerged as a solution to declining groundwater levels in our region. Being a leader in sustainability practices in our region, IZTECH has the mission to lead by example. Therefore, an extensive effort was initiated to convert all possible surfaces from water impenetrable ones to water penetrable ones (5). As a result, the water penetrating surfaces of the campus were increased extensively. It is not an easy task to measure the effect of this project on the groundwater levels but nevertheless IZTECH has done its due part to help conserve as much water as it can.

Figure 5.

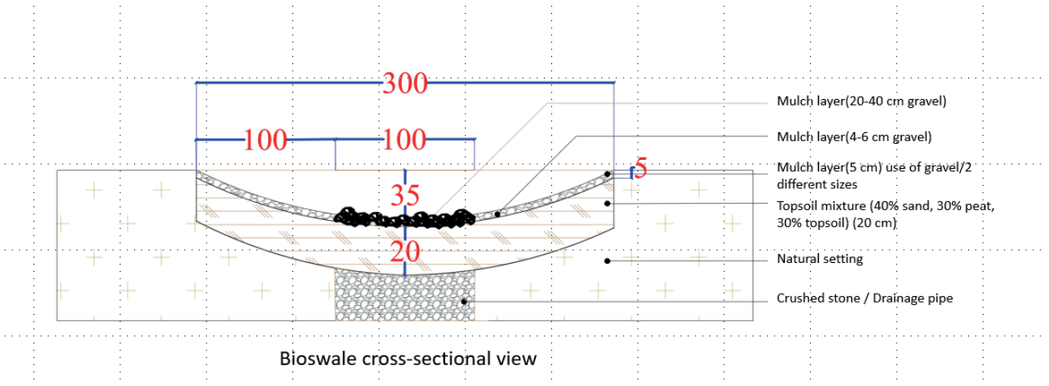
Rainwater Harvesting Project

Located in the coastal Aegean region, IZTECH campus is experiencing semi-arid climate and therefore, every single drop of water counts. To monitor the efficiency of a rainwater harvesting project, academicians from the Architecture Faculty and Engineering Faculty came together to project annual rainfall and calculate expected collected water amount based on the roof area (50 m2). Based on these calculations two water tanks with a total volume of 6 m3 were installed right next to the General Education Courses Building. The location of the building and pictures of the installation are given below (6). Rainwater collected in the system was measured as 4 m3 for the year 2023 so far.

Figure 6.

Bioswale Project

To safely direct rainwater that is coming from a parking lot, a bioswale was constructed. Bioswales are built to collect polluted stormwater runoff and while allowing its infiltration into the soil, they conduct filtration. The design of the bioswale required minimum intervention in the natural setting. However, it included a minimal excavation of 55 cm at the deepest end, below which perforated drainage pipes were installed. Then a layered structure of topsoil, mulch and gravel was laid (7). The finished implementation can be seen in (8). The project prevented uncontrolled flow and flooding of the IZTECH Recreational Area in the year 2023.



Bioswale cross-sectional view

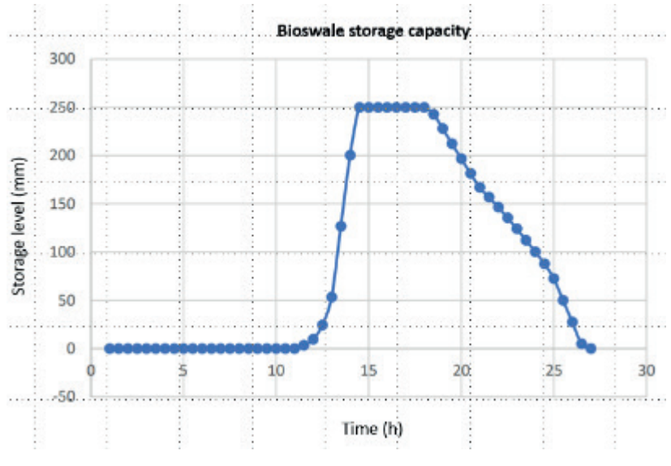


Figure 7.

İYTE BIOSWALE PROJECT

Trapezoidal		Highlighted	
Bottom Width (m)	= 1,0000	Depth (m)	= 0,2500
Side Slopes (z:1)	= 3,0000, 3,0000	Q (cms)	= 0,9474
Total Depth (m)	= 0,3500	Area (sqm)	= 0,4375
Invert Elev (m)	= 0,1000	Velocity (m/s)	= 2,1654
Slope (%)	= 2,0000	Wetted Perim (m)	= 2,5811
N-Value	= 0,020	Crit Depth, Yc (m)	= 0,3292
		Top Width (m)	= 2,5000
Calculations		EGL (m)	= 0,4892
Compute by:	Known Depth		
Known Depth (m)	= 0,2500		

IZTECH BIOSWALE REPORT

WATERSHED ANALYSIS

Hydrograph type	= Runoff	Peak discharge	= 0,010 cms
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 31,1 cum
Drainage area	= 0,060 hectare	Curve number	= 98*
Basin Slope	= 6,0 %	Hydraulic length	= 42 m
Tc method	= User	Time of conc. (Tc)	= 3,00 min
Total precip.	= 61,10 mm	Distribution	= Custom - Izmir
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0,019 x 98) + (0,040 x 98)] / 0,060

Figure 8.

30th Anniversary Park

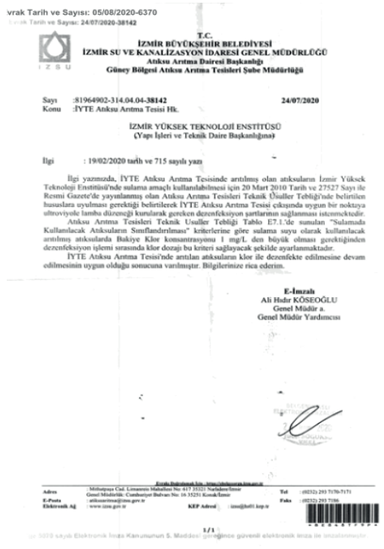
To commemorate IZTECH's 30th birthday, a park was built. The previously natural and relatively bare environment (9) was landscaped with water retaining plants to conserve water (10). Cypress, oleander, pine, and salvia were specifically picked for the project. The park was located between the Faculty of Science buildings and student dormitories. A total of 8100 m2 area was landscaped. The project was co-sponsored by the Aegean Forest Foundation.

Figure 9.

Figure 10.

Figure 10.

Figure 11.



vrak Tarih ve Sayısı: 05/08/2020-6370

T.C.
İZMİR BÜYÜKŞEHİR BELEDİYESİ
İZMİR SU VE KANALİZASYON İDARESİ GENEL MÜDÜRLÜĞÜ
Atıksu Arıtma Dairesi Başkanlığı
Güney Bölgesi Atıksu Arıtma Tesisleri Şube Müdürlüğü

Sayı :81964902-314.04.04-38142 24/07/2020
Konu :İYTE Atıksu Arıtma Tesisi Hk.

İZMİR YÜKSEK TEKNOLOJİ ENSTİTÜSÜ
(Yapı İşleri ve Teknik Daire Başkanlığına)

İlgi : 19/02/2020 tarih ve 715 sayılı yazı

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Atıksu Arıtma Tesisleri Teknik Usuller Tebliği Tablo E7.1.de sunulan "Sulamada Kullanılacak Atıksuların Sınıflandırılması" kriterlerine göre sulama suyu olarak kullanılacak arıtılmış atıksularda Bakiye Klor konsantrasyonu 1 mg/L den büyük olması gerektiğinden dezenfeksiyon işlemi sırasında klor dozajı bu kriteri sağlayacak şekilde ayarlanmaktadır.
İYTE Atıksu Arıtma Tesisi'nde arıtılan atıksuların klor ile dezenfekte edilmesine devam edilmesinin uygun olduğu sonucuna varılmıştır. Bilgilerinize rica ederim.

E-İmzalı
Ali Hadr KÖSEOĞLU
Genel Müdür a
Genel Müdür Yardımcısı

Figure 12.

1.2. Water Recycling Program:

IZTECH has previously initiated a collaboration with the Izmir Water and Wastewater Directorate (IZSU) regarding reuse of treated water on IZTECH campus. The IZTECH Wastewater Treatment Plant is located very close to the IZTECH campus, only 1.5 km away (11). IZTECH's wastewater is collected and transported through pipes to the nearest wastewater treatment plant (coordinates: 38.31248,26.64267; elevation: 24.6 m) run by the Izmir Metropolitan Municipality Water and Wastewater Treatment Directorate (IZSU). Wastewater treatment plant is operated based on an activated sludge process that can achieve carbon and nitrogen removal. Recently IZSU has increased the capacity of the wastewater treatment plant from 290,000 m3/year to 360,000 m3/year, in order to serve the neighboring districts. Moreover, per the agreement reached with IZSU (initiated in 2020), effluent from the wastewater treatment plant is disinfected using chlorination so that IZTECH can safely use that water for irrigation of landscaped areas and trees (12).

Considering the wastewater treatment plant is able to treat 1500 m3/day for IZTECH, it is safe to say that 100% of IZTECH's wastewater is actually recycled and made readily available for irrigation purposes. Effluent from the wastewater treatment plant was analyzed at the labs of IZTECH for suitability in irrigation of landscaped areas and olive trees. Thus the chlorine concentration was adjusted to prevent any harm that may be done to plants. Following the protocol that was signed between IZTECH and IZSU, the disinfected effluent was pumped to a recycled water tank (15 m3) that is located at a higher elevation (73 m) in the campus (13). Being in a semi-arid area, IZTECH's water demand for plant irrigation rises, especially in the summer season. From October 2022 to October 2023, 342755 m3 water was consumed at IZTECH campus. In the graph below, while the blue stacks represent the water consumption for domestic uses, the orange stacks represent the irrigation water consumption for the reporting period (14).

Figure 13.

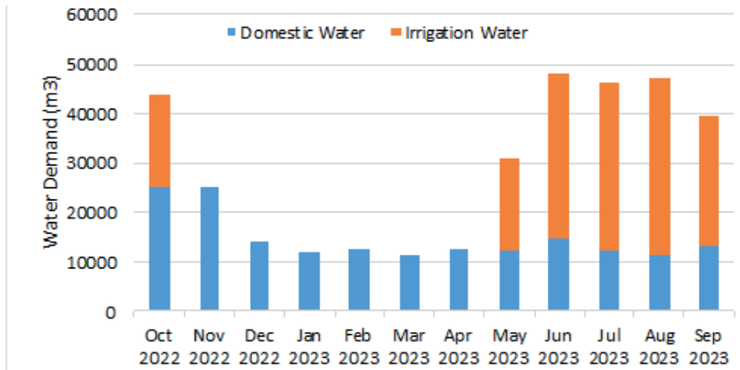


Figure 14.

As the effects of the climate change has become more severe in the recent years, watering of green areas and trees on campus is needed to be done daily during the prolonged dry season with minimal rainfall, which corresponds to May-October. The use of recycled wastewater substitutes for freshwater abstraction, which corresponds to approximately 52% of the water demand for the reporting year.

1.3. Water Efficient Appliances:

In order to minimize water consumption in hand-washing, motion-activated taps were installed throughout the campus (15). Some of the old taps were replaced with the new motion-activated ones, and the new buildings were all equipped with the motion-activated taps (Table 1). The data were retrieved from the Construction Works Directorate of IZTECH.

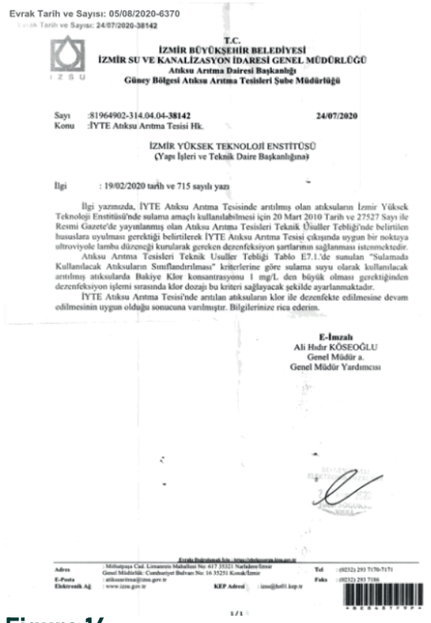
Appliance	Total Number	Total number water Efficient appliances	Percentage
Taps	784	489	62.3%
		Average Percentage	**62.3 %**

Table 1. Motion activated taps in IZTECH bathrooms.

Figure 15. Water Efficient Appliances Usage (Izmir Institute of Technology, TR)

1.4. Consumption of Treated Water:

IZTECH has previously initiated a collaboration with the Izmir Water and Wastewater Directorate (IZSU) regarding reuse of treated water on IZTECH campus (16). The IZTECH Wastewater Treatment Plant is located very close to the IZTECH campus, only 1.5 km away (17). IZTECH's wastewater is collected and transported through pipes to the nearest wastewater treatment plant (coordinates: 38.31248,26.64267; elevation: 24.6 m) run by the Izmir Metropolitan Municipality Water and Wastewater Treatment Directorate (IZSU). IZTECH Wastewater treatment plant (WWTP) is operated based on an activated sludge process that can achieve carbon and nitrogen removal. Recently IZSU has increased the capacity of the wastewater treatment plant from 290,000 m3/year to 360,000 m3/year, in order to serve the neighboring districts. Moreover, per the agreement reached with IZSU (initiated in 2020), effluent from the wastewater treatment plant is disinfected using chlorination so that IZTECH can safely use that water for irrigation of landscaped areas and trees. Effluent from the wastewater treatment plant was analyzed at the labs of IZTECH for suitability in irrigation of landscaped areas and olive trees. Thus the chlorine concentration was adjusted to prevent any harm that may be done to plants. Following the protocol that was signed between IZTECH and IZSU (16), the disinfected effluent was pumped to a recycled water tank (15 m3) that is located at a higher elevation (73 m) in the campus (17). Being in a semi-arid area, IZTECH's water demand for plant irrigation rises, especially in the summer season. From October 2022 to October 2023, a total of 342755 m3 water was consumed at IZTECH campus for domestic and irrigation purposes. Irrigation water, which is the recycled water treated at IZTECH WWTP, corresponded to 52% of the total water consumption.



Evrak Tarih ve Sayısı: 05/08/2020-6370

Evrak Tarih ve Sayısı: 24/07/2020-38142

T.C.
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İZMİR YÜKSEK TEKNOLOJİ ENSTİTÜSÜ
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Genel Müdür a.
Genel Müdür Yardımcısı

Figure 16.

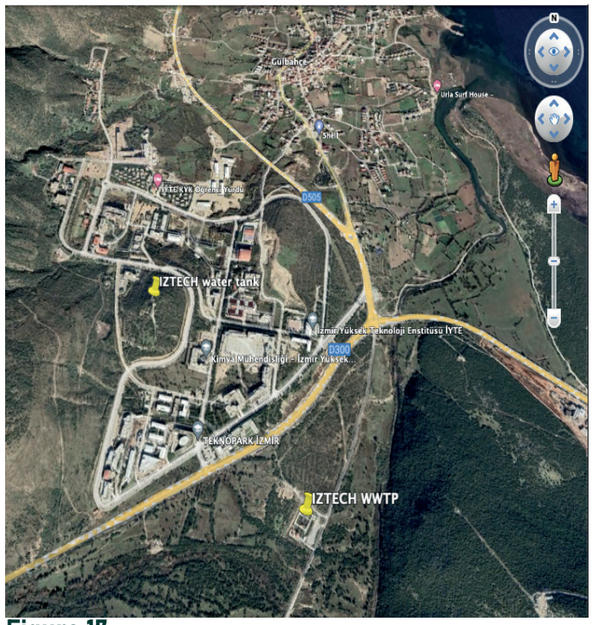

Figure 17.

In the graph given in Section "Water Recycling Program", while the blue stacks represent the water consumption for domestic uses, the orange stacks represent the irrigation water consumption for the reporting period (14). As the effects of the climate change has become more severe in the recent years, watering of green areas and trees on campus is needed to be done daily during the prolonged dry season with minimal rainfall, which corresponds to May-October. The use of recycled wastewater substitutes for freshwater abstraction, which corresponds to approximately 178240 m3 for the reporting year.

1.5. Water Pollution Control in Campus Area:

Policy

IZTECH has identified actions towards mitigation and adaptation to climate change as its priority. Thus, projects on water conservation has gained impetus in recent years. Since IZTECH does not have direct or indirect discharge to any nearby water body, it prevents pollution by default.

In its 2019-2023 Strategic Plan IZTECH has identified sustainability as an important target and put in hard efforts to realize that target by:

- Decreasing plastic use by distributing glass water bottles and building water fountains throughout the campus.
- Decreasing paper use by encouraging two-sided printing and shifting to Electronic Document Management System.
- Increasing water conservation by increasing permeable surfaces, renovating surface runoff regions in campus and building a rain harvesting system.
- Supporting academic staff on grant applications on climate change.

Wastewater Treatment

Sewage is collected through closed pipes at IZTECH campus and it flows towards the IZTECH Wastewater Treatment Plant, that is managed and operated by İzmir Metropolitan Municipality Water and Wastewater Directorate (IZSU) abiding the national wastewater treatment and discharge regulations (18).The wastewater treatment plant is designed to treat 2000 m3/day flow rate and the treatment is done by an activated sludge system (19). Previously, treated water did not meet the national standards for irrigation.

Therefore, IZTECH Rectorate has contacted IZSU officially in 2020, in order to implement a disinfection unit on the effluent stream, producing treated water that is suitable for irrigation use. Following the disinfection unit's implementation in 2020, treated wastewater from the wastewater treatment plant is pumped to a storage unit in IZTECH campus at higher elevation and is used for irrigation of all green areas on campus.

Guideline standard

IZTECH is bound by national law regarding its discharges to closed channels that conveys wastewater to IZTECH WWTP. The Water Pollution Control Regulation has been put in effect in 2004 . The regulation aims to ptotect the potential of water resources, prevent water pollution and to determine the technical and legal aspects in water management for sustainable development. According to Table 21 of the regulation, the discharge standards are given below.

Parameter	If the sewer system is connected to a WWTP (2 hour composite sample)
Temperature (°C)	40
pH	6 -10
Suspended Solids (TSS) (mg/L)	500
Oil and grease (mg/L)	150
Petroleum and derivatives (mg/L)	50
Chemical Oxygen Demand (COD) (mg/L)	1000
Biochemical oxygen demand (BOD_5) (mg/L)	-
Total nitrogen(N)* (mg/L)	100*
Total phosphorus (P)* (mg/L)	10*
Phenol (mg/L)	20
Sulfate (SO_4^{-2}) (mg/L)	1700
Arsenic (As) (mg/L)	3
Lead (Pb) (mg/L)	3
Mercury (Hg) (mg/L)	0.2
Cadmium (Cd) (mg/L)	2
Cyanide (CN^-) (mg/L)	10
Chromium (Cr) (mg/L)	5
Free chloride (mg/L)	5
Sulphur (S) (mg/L)	2
Copper (Cu) (mg/L)	2
Nickel (Ni) (mg/L)	5
Zinc	10
Stannum (Sn) (mg/L)	5
Silver (Ag) (mg/L)	5
Chloride (Cl^-) (mg/L)	10000

https://www.mevzuat.gov.tr/MevzuatMetin/yonetmelik/7.5.7221.pdf

Monitoring and Evaluation

According to the Regulation mentioned above, the legal authorities conduct monitoring in 6-month intervals on random samples collected from manholes (18).

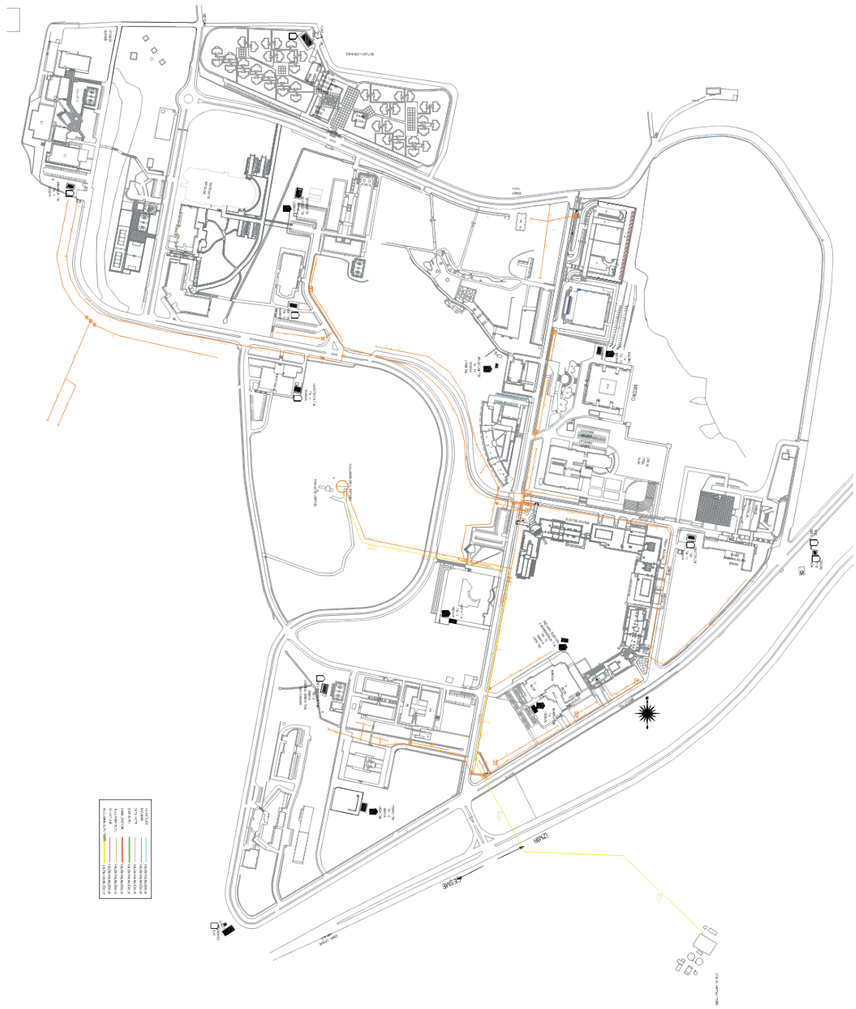

Figure 18. Wastewater collection system project for IZTECH

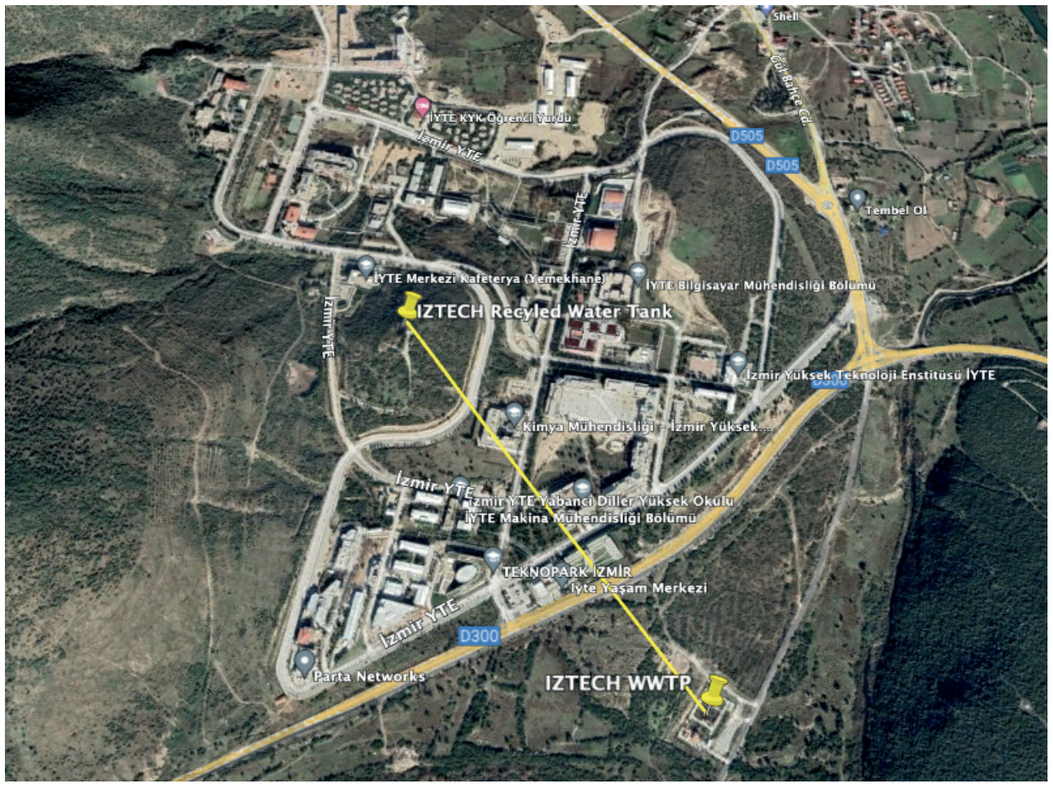

Figure 19. IZTECH recycled water tank and IZTECH Wastewater treatment plant

5- Transportation

The Izmir Institute of Technology (Iztech) campus provides a natural, calm, and sustainable life to the staff and students throughout the year. Regarding transportation, the sustainability concept attracts attention for several reasons. For instance, most of the common buildings of the Iztech are accessible from different parts of the campus as they are located in the heart of the settlement to provide efficient transportation during the year. The central library, integrated research centre, festival area, sports centre, performance centre, swimming pool and technopark are located on the main axis of the campus. Therefore, staff and students can easily access this main axis from various other common buildings such as dormitories, faculties, and central cafeteria. The other reason is that Iztech continues to develop new policies on sustainable transportation while providing several alternatives to access the campus from close and far locations of the Izmir Metropolitan Area using public buses, ring services, e-scooters, e-vehicles and bikes. The current situation and strategies are explained in different topics of sustainable transportation.

Vehicle use: The Iztech regularly uses fourteen (14) cars for administration, education, and research purposes throughout the year. In addition to those cars, the Iztech also manages seven (7) vehicles for various purposes such as sewage disposal trucks, fire trucks, and so on. Each three (3) gates of the Iztech campus, which are located on the east (main gate), south (secondary gate), and north (Gülbahçe Village gate), is equipped with a Licence-Plate Recognition System (LPRS).

For those who would like to pass through LPRS via personal vehicles, registration of the plate and documents is required as a campus policy. Thanks to the LPRS system, the entrance of the registered cars to the Iztech campus area is monitored automatically. For those who are not the occupants of the campus (visitors), the security of the Iztech administrates the car of each visitor, one by one.

Shuttle services: The Iztech provides a free shuttle service on the campus, to the dormitory and Gülbahçe Village. The shuttle takes up to 50 passengers, whereas 27 passengers can be seated. This shuttle service is free of charge for everyone on the campus including staff, students, and visitors. The existing bus stops on the campus are used as hop-on locations. The route of the shuttle service is also extended to the nearest settlement, called Gülbahçe Village, where some of the undergraduate and graduate students reside. Thanks to the extended schedule, the students can use the shuttle service in the late evening between the central library of Iztech to the dormitories and village. Besides, public buses run by the Izmir Metropolitan Municipality also circulate in the campus and around the village.

Figure 1: Campus Shuttle

Figure 2: Electric Public Busses Serving to The Campus

Policies on zero emission vehicles: The campus life of Iztech encourages students and staff to use bicycles for campus transportation. The entire road network on the Iztech campus is shared with bicycles and the shared roads have a strict vehicle speed limit of 30 km/h. The elevated crosswalks, evenly distributed on mostly occupied roads by vehicles and bicycles, provide safe pedestrian access and serve as speed ramps for motor vehicles on the campus. Moreover, there are separated bikeways and pedestrian ways (pathways) between main buildings where human traffic is high. All these individual pathways are lighted up for security. Besides, each faculty settlement on the campus provides a secure bicycle parking area near the buildings. Regarding the use of bicycles on the Iztech campus, an occupancy rate study was conducted considering the bicycles requested from the parking lots and bike trips completed. The results showed that approximately 90-110 private bicycle trips were completed per/day. The Ministry of Health of Türkiye donated 59 bicycles to Iztech. The Cycling Community of Iztech manages these bicycles to let the use of occupants of the Iztech campus free of charge. Moreover, Unibike, which is a bike-sharing system provides 50 bikes to be used on the campus with a very little amount of charge. Starting with the 2023-2024 academic year, all Unibikes are maintained and ready to be used in the Iztech campus. Besides, a private company of Izmir Karşıyaka Municipality, known as Kumru Scooter, provides 40 e-scooters that can be rented via mobile phone application in the campus. Regarding electric vehicles, two minivans, which are actively used for routine freight transportation on the campus, are donated to the Iztech by a private cargo company. In addition, Iztech owns two e-bikes, which are administered by the Faculty of Engineering for agricultural and civil engineering purposes.

The Iztech is planning to purchase an electric minibus in the upcoming years to provide a more sustainable shuttle service on the campus while decreasing the CO2 emissions of the campus area. Thanks to the mutual agreement between Iztech and İzmir Metropolitan Municipality, electric public buses have started to serve from the city center to the campus location, regularly. The electric buses and their schedule can be checked from the link given below. With the same agreement, İzmir Metropolitan Municipality provides at least four bus runs with a bicycle carrier in all public bus lines serving the campus.

Figure 3: Cycling at Iztech

Figure4: E-Scooters Operating in The Campus Area

Figure 5: Electric Vehicles Owned by The Iztech

Figure 6. Main entrance of the campus

Figure 7. Crosswalks of Iztech

Figure 8. Shuttles for staff

Figure 9. Public transportation between Iztech and Izmir

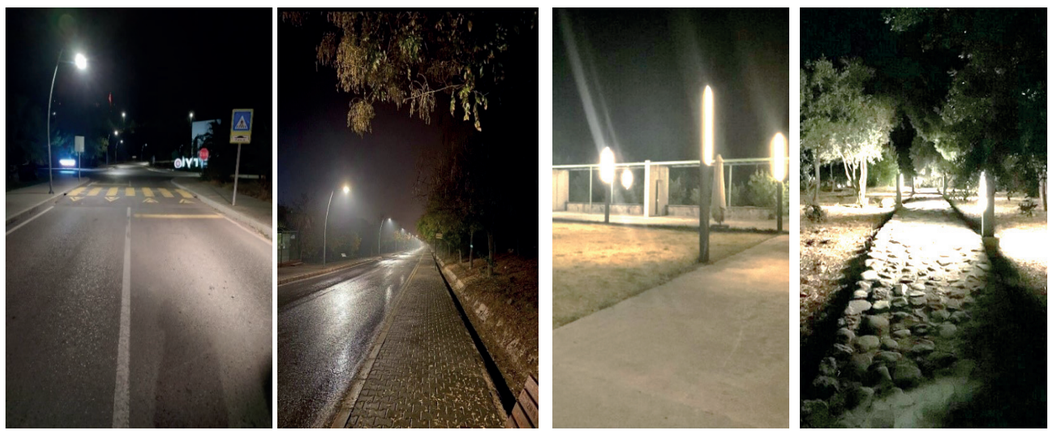

Figure 10. Lighting of vehicle and pedestrian roads

5- Education & Research

As a leading national research institute, IZTECH aims to integrate principles of sustainability into its pioneering research and education. In IZTECH, the total number of courses offered, including graduate and undergraduate degrees, are 4718. Among them, 1110 courses are related to sustainability. These courses are offered in Faculties of Engineering, Natural Sciences, and Architecture. Even majority of the courses in Departments of Environmental Engineering, Material Science and Engineering , Energy Systems of Engineering, City and Regional Planning, Architecture and Molecular Biology and Genetics covers a variety of aspects in sustainability and satisfies sustainability development goals with their curriculum and educational program targets. In recent years, there have been efforts to offer sustainability related courses common to whole students in IZTECH. For example, the course of “Global Sustainable Development” offered by the department of Chemical Engineering for the last three years is open to all students. It covers the topics/issues about sustainable production and development. The aim of the course is to present negative effects of production processes on the environment and society and to inform about what should be done to reduce this. The course of “Socio-cultural studies in Architecture” involves i.e. topics of gender and space, politics of difference and globalization; so it aims to enhance the competence of students in the areas of ecology and sustainability. It serves for focusing target of SDG of “1-no poverty”, “5-gender equality”, and “11-sustainable cities and communities”. The courses mostly in Department of Bioengineering aims to train students and give them

the necessary knowledge to produce high value technologies, products and information using innovative bioengineering approaches to solve problems in national and international priority areas such as health and pharmaceutical industry, and environmental and energy industry. They basically target SDGs of "3-good health and well being", "9-industry, innovation and infrastructure". The course of "Economy and Design of Engineering" in Chemical Engineering The course aims to provide students with an understanding of entrepreneurship, innovation, and sustainable development, and knowledge of professional life, including project management, risk management, and change management. The course of "Introduction of Bioenergy" in Energy Systems Engineering follows sustainability reated topics, such as, Biomass energy and types of biomass; heat and power generation from biomass; methods and technologies for biofuels production in solid, liquid and gaseous forms; utilization of organic municipal waste using biomass conversion technologies.

Course Name	Programme / Department	Link to / Relationship with Sustainability and Related Themes (Ecology, Environment, Energy, Water Resources, Society, Economy, etc.)
Advanced Hidrogeology	Department of International Water Resources (PhD Programme)	Following topics are covered in this course: Groundwater movement. Groundwater resources. Well hydrology. Pump testing. Improvement o catchments area. Management and improvement of aquifers. Water-rock interaction and fossil groundwater mining. Sustainability is a core issue.
Water Legislation	Department of International Water Resources (PhD Programme)	Following topics are covered in this course: Importance and future application of law on water resources. Surface and groundwater law. International water resources law. Gaps in water law.Sustainability is a core issue. Sustainability is a core issue.
GIS Applications in Water Resources Science	Department of International Water Resources (PhD Programme)	Following topics are covered in this course: Introduction to geographica information systems. Spatial data. Map projections. Raster data. DEMs. Raster processing. Hydrology tools. Sustainability is a core issue.
Groundwater Remediation Modeling	Department of International Water Resources (PhD Programme)	This course covers technical themes related to groundwater remediation. Sustainability is a core issue.
Food Chemistry	Department of Food Engineering	This is a cumpolsary course that deals with structure and properties of food components (water, carbohydrates, proteins, lipids, others), of the Department of Food Engineering, whose aim is to train researchers and engineers who are environmentally conscious, professional, and ethical. Sustainability related topics are covered.
Applied Nutrition in Food Science	Department of Food Engineering	This course focuss on the clinical approaches to determine importance of the nutrients in human health. Sustainability related issues are integrated.
Principles of Food Safety and Quality Assurance	Department of Food Engineering	This course focuses on the principles of food safety and quality and sustainibility related issues are integrated.
Environmental Chemistry	Chemical Engineering	The topics covered in this course are; the definition of environmental terms, the fundamentals of geochemistry, atmospheric chemistry, environmental microbiology, water chemistry and treatment chemistry defined in the view of clean and polluted environment, etc. Sustainability issue is a core topic.
Biomass Conversion to Chemicals And Fuels	Chemical Engineering	This course introduces various processes used in converting biomass into biofuels and chemicals and covers issues related to sustainability.
Biomaterials	Chemical Engineering	Biomedical application of materials obtained from natural and synthetic sources and sustainability related issues are covered.
Combustion Phenomena	Masters in Chemical Engineering	Combustion phenomena and related issues are covered with an aim to provide students with an understanding of sustainable development.
Water and Waste Treatment	Masters in Chemical Engineering	Following topics are covered: Characteristics of water and airborne wastes treatment processes and kinetics; treatment system design: Process interactions, optimal design, treatment needs related to water supply. Sustainability is a core topic.
Unit Operations and Processes of Water Treatment	Environmental Engineering	This course is one of the compulsory and fundemental courses of the Department of Environmental Engineering, whose aim is to protect health of human beings and the environment by assessing exposures and associated risks to determine mitigation needs, by developing better monitoring and sampling techniques, better treatment processes, and environmental standards. Environmental sustainabiliy is a core issue.
Water Supply	Environmental Engineering	Sustainability related issues, with an economic and water focus are covered.
Atmospheric Chemistry and Air Pollution	Environmental Engineering	This course is one of the compulsory and fundemental courses of the Department of Environmental Engeenering, whose aim is to protect health of human beings and the environment by assessing exposures and associated risks to determine mitigation needs, by developing better monitoring and sampling techniques, better treatment processes, and environmental standards. Environmental sustainabiliy is a core issue.
Water Quality	Environmental Engineering	This course is one of the compulsory and fundemental courses of the Department of Environmental Engeenering, whose aim is to protect health of human beings and the environment by assessing exposures and associated risks to determine mitigation needs, by developing better monitoring and sampling techniques, better treatment processes, and environmental standards.
Building Technology and Science	Architecture	The course covers technical themes related to building technology and contibutes to students' understanding of sustainability in its wider framework.
Ecological Studies in Architecture	Architecture	Theoretical framework of **ecological approach** and its reflection to architecture; The concepts of **green and sustainable architecture**; Historical evolution of **ecological design in architecture**; The examples of different approaches in ecological point of view from Turkey and the other countries.

Figure 1. Selected samples of sustainability related courses in IZTECH.

IZTECH has a research ecosystem that is unique for Izmir as the campus area also includes a planned technology development zone, Technopark IZMİR, Innovation Center, Technology Transfer Office, and Research Centers. Also, the bureaucratic processes continue to open a research center titled “Center for Sustainability and Resiliency”. A new research center established in 2022, named “Wind Energy Meteorology and Environmental Application and Research Center” serves strongly for sustainability related research and activities as a whole (https://ruzmer.iyte.edu.tr/en/). This center provides connections and coordinations between IZTECH, Izmir Development Agency (İZKA) and the Republic of Turkiye Ministry of Industry and Technology. Geothermal Energy Research and Application Center (GEOCEN) is another and a former one continuing its activities at the Integrated Research Center (IRC). It serves in 3 laboratories: Modeling, Energy and Hydrogeology laboratories. (https://geocen.iyte.edu.tr/en/)

Individual researchers as faculty members also conduct research and work with master and doctorate candidates. Sustainability research in IZTECH gets fund from EU projects, The Scientific and Technological Research Council of Turkey (TUBİTAK) projects and our university (BAP). In 2023, total research funds are calculated as 102 706 146 USD, while the total research funds dedicated to sustainability research are calculated as 96 195 517 USD. However, In 2022, total research funds were calculated as 7 274 423 USD, while the total research funds dedicated to sustainability research were calculated as 5 427 008 USD. So, already representing a majority in the overall research, research funded dedicated to sustainability is expected to increase in the next years. A variety of departments including Civil Engineering, Food Engineering, Architecture, Material Science and Engineering, Bio-engineering and City Planning and Environmental Engineering have become partners of EU projects, and have got funding from other institutions. . Sustainability research projects follow the UN Sustainable Development Goals (SDG) in general. That means,i.e., research about evaluations of agricultural and food waste in the discipline of Food Engineering can satisfy the SDG of “1-No Poverty”, “3-Good Health and Well being”, “9-Industry, Innovation and Infrastructure”, “15-Life on Land”. Besides, a EU funded project (Eyes Hearts Hands) in the Faculty of Architecture is about sustainable transformations of urban landscapes and green transitions of cities. Its target relates to the SDG of “11-sustainable cities and communities”, “13- Climate Action” and “15-Life on Land”.

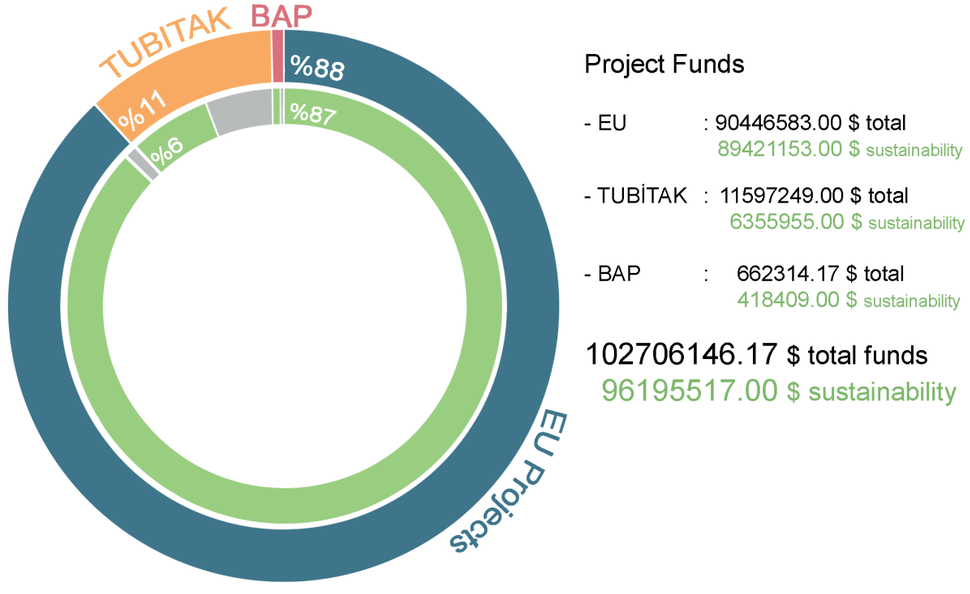

Figure 2. Breakdown of research funds in IZTECH, Izmir, Turkiye.

(https://surdurulebilir.iyte.edu.tr/projects/)

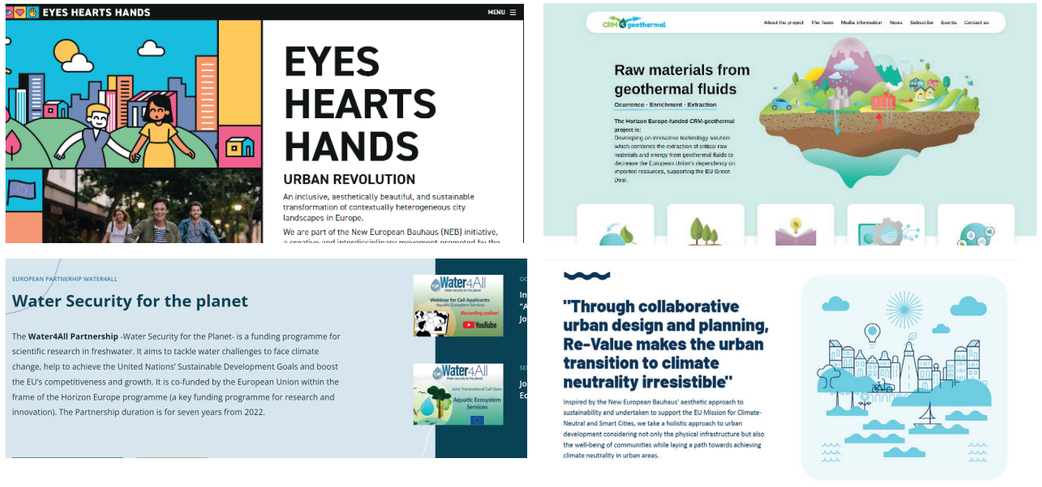

Figure 3. Samples of EU projects funded in 2023. (https://eyesheartshands.eu/; https://crm-geothermal.eu/; https://www.water4all-partnership.eu/; https://re-value-cities.eu/)

IZTECH research ecosystem has a powerful research GCRIS Database, which includes academic publications/any outputs and research items (awards, projects, equipment, report, organizations); associates these outputs with researchers, providing advanced metrics/statistics. So, every researcher's contribution to SDG's are counted and presented in this database. That makes a strong impact on the visibility of our research activities and transforms every aspect of our research on the international basis (https://gcris.iyte.edu.tr/?locale=en). According to google scholar records and our GCRIS Database (with keywords of green and sustainability), in the last three years (2021-2023), a total of 1120 publications are present on the issues of sustainability which makes average of 373 publications per annum. Additionally, the research ecosystem supports applications of patents in sustainability areas. For example, a patent by Civil Engineering, names as "autonomous coanda type water intake structure" and Technology, Design and Innovation Management, names as " environmentally compatible recycling box with light indicator system that tracks fullness and waste management" (https://surdurulebilir.iyte.edu.tr/patents/)

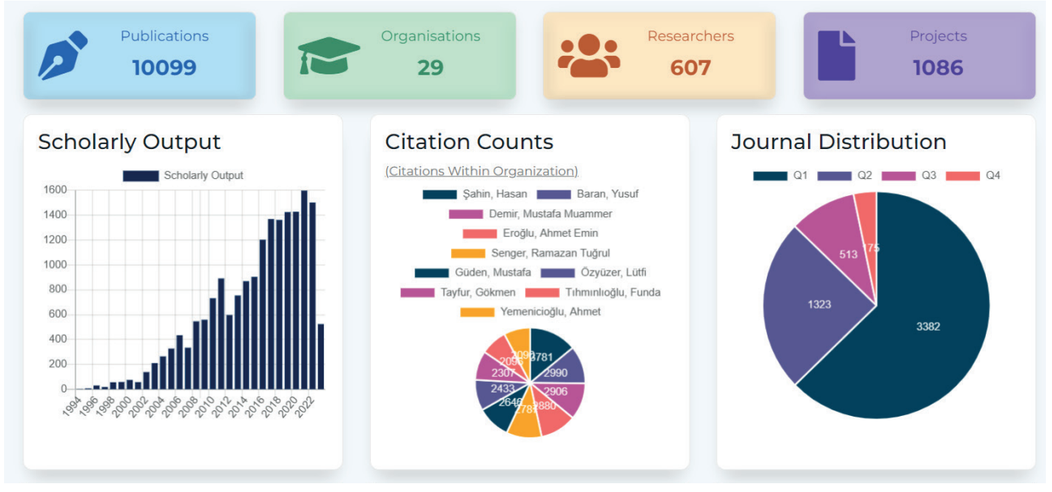

Figure 4. IZTECH GCRIS Database website (https://gcris.iyte.edu.tr/?locale=en).

Figure 5. An example of a researcher's contribution to SDG. (https://gcris.iyte.edu.tr/cris/rp/rp00142)

To mention sustainability related events, department of health, culture and sports, student organizations, faculties and individuals (academic people and students) take part in organizing a variety of activities in IZTECH Campus and in the city of IZMİR as well. All these cultural, academic and social related activities existing in the campus explain social dimension of sustainability in IZTECH. The aim of the Department of health, culture and sports is to provide support for students' physical and mental wellness and health, to improve their personal abilities and personalities (https://sks.iyte.edu.tr/en/about-us/). So that makes this department a key link for achieving sustainable development goals. The total number of events related to environment and sustainability issues which were hosted or organized by different departments, units, and members of the University in the academic year 2021-2023 is 155. These events include conferences, workshops, awareness raising and practical trainings. While this number is 29 in 2021, it is 47 in 2022 and 79 in 2023 respectively with an increasing trend line after the pandemic period. This increase is partly related to increased attention towards sustainability issues because of the pandemic. Additionally, student initiatives focusing on sustainability and environmental issues also exist within the campus. The number of student organizations at IZTECH campus dealing with sustainability in different areas are around 40. Some examples are Permaculture and Ecological Living Community, Environment and Young TEMA Community, ECO-Motion Community, Natural Research Community, Women in Business, etc. (https://sks.iyte.edu.tr/en/culture/student-societies/)

Figure 6. A collection of cultural activities and students' organization events in IZTECH.

There is a website titled "Sustainable Green Campus" which was established on 2020 (https://surdurulebilir.iyte.edu.tr/en/). The website is regularly updated and designed to include announcements of sustainability related events, projects, student organizations and news. Also, the website is connected to collection of publication and these related to sustainability under IZTECH Library Catalogue.

IZTECH gets the 3rd rank among the state universities in Turkiye that was found successful in transition to distant education. Trainings were given to both students and faculty members to ease the transition process to distant and online learning systems. Microsoft Teams that offer classrooms and meeting spaces was adopted.

An online classroom was established to be used by faculty members to record their lectures. More than 1000 lectures were recorded by using Microsoft Teams and Adobe Connect. Tablet computers were distributed to support faculty members and students to continue education by online means. Apart from that, sanitation related measures (i.e. signs and mask/disinfection stands) were adopted all around the campus.

IZTECH is home to 18 of sustainability-related startups. The number is expected to increase in the coming years. To initiate this, IZTECH has become a part of scheme that funds innovate start-ups. The call for this year supports startups that are in line with Green Growth approach. Some of them work on material technologies, clean energy, renewable energy (solar and wind), and recycling; while some others focus on developing innovative, water treatment solutions or optical systems, LED lighting, and the use of microalgae as a raw material in biodiesel production, from CO2 disposal to production in domestic waste water.

(https://teknoparkizmir.com.tr/en/)

Figure 7. Views from the location of Teknopark Buildings and Innovation Center in the IZTECH