SDG PROGRESS REPORT

on SDG-6 CLEAN WATER and SANITATION

2021

ISTANBUL MEDENIYET UNIVERSITY

SUSTAINABLE DEVELOPMENT GOALS

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SDG PROGRESS REPORT

ISTANBUL MEDENIYET UNIVERSITY

Istanbul Medeniyet University
Sustainability Office

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6 CLEAN WATER AND SANITATION

Water scarcity affects more than 40 percent of people, an alarming figure that is projected to rise as temperatures do. Although 2.1 billion people have improved water sanitation since 1990, dwindling drinking water supplies are affecting every continent.

More and more countries are experiencing water stress, and increasing drought and desertification is already worsening these trends. By 2050, it is projected that at least one in four people will suffer recurring water shortages.

Safe and affordable drinking water for all by 2030 requires we invest in adequate infrastructure, provide sanitation facilities, and encourage hygiene. Protecting and restoring water-related ecosystems is essential.

Ensuring universal safe and affordable drinking water involves reaching over 800 million people who lack basic services and improving accessibility and safety of services for over two billion. In 2015, 4.5 billion people lacked safely managed sanitation services (with adequately disposed or treated excreta) and 2.3 billion lacked even basic sanitation.

UN SDG

WORLD

2,4 BILLION

people worldwide do not have access to basic sanitation services like toilets or latrines

%40

of the global population affected by water scarcity and that figure is projected to rise

1.000 CHILDREN

die due to preventable water and sanitation-related diseases each day

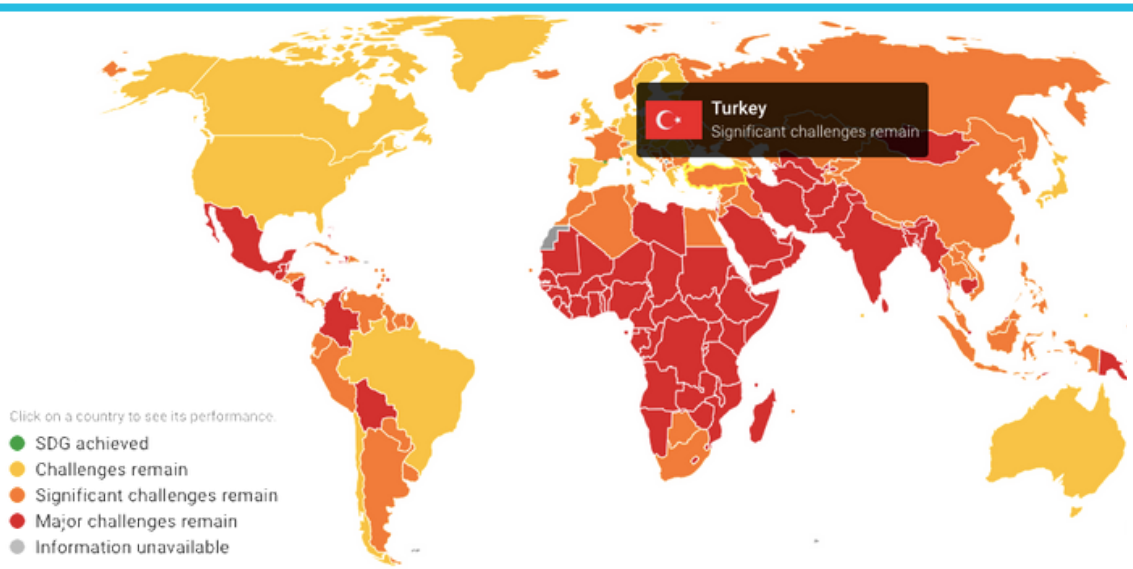
%80

of wastewater from human activities is discharged into waterways without any pollution removal

40 BILLION

hours spent by women in sub-Saharan Africa for collecting water, each year

TURKEY



IMU

5.480.600 M³
WATER
used in IMU campuses

345 M³
WATER
used for
per campus member

grey water treatment system

OPERATIONS

Water Consumption Tracking

With the awareness that water is the foundation for life and is not an unlimited resource, Istanbul Medeniyet University measures the amount of water used in all our campuses and develops strategies to reduce the water consumption per person. The amount of water consumed in all campuses of our university in 2021 was 5,480,600 m3 with an annual **water consumption per person of 345 m3.**

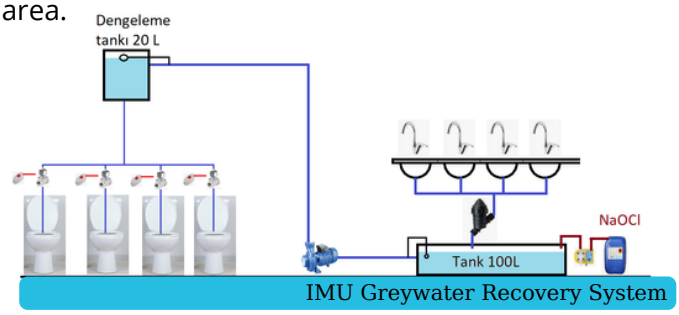
> **345M³ WATER**
> consumed per campus community member

Distribution of the amount of water consumed in our campuses according to the types of water usage shows that green space irrigation has a significant share in water consumption. Therefore, certain measures are implemented in IMU campuses to reduce the amount of water used for green space irrigation. All the green spaces in our campus areas are irrigated by sprinkler systems. Irrigation is carried out through the stations installed with adequate intervals and the system is activated in the early morning and evening hours when evaporation is the lowest, thereby saving water. In addition, in areas where underground water usage is available, as in our Göztepe North and South Campuses, well water is also used as complementary to green space irrigation.

Wastewater Treatment

Wastewater from campus use is collected by the wastewater network and dispatched to the treatment facilities of Istanbul Water and Sewerage Administration (İSKİ), which is in charge of treating wastewater using various systems from preliminary treatment to advanced biological treatment so that wastewater is eliminated without environmental damage and water resources, Istanbul Strait, and the Marmara Sea are protected from the threat of wastewater.

As Istanbul Medeniyet University, we are developing projects for waters within our campus area that we can reuse after treatment. In 2021, the **"Greywater Recovery Project"** was initiated under the leadership of Prof.Dr. Erkan ŞAHİNKAYA and Asst.Prof.Dr. Yasin KARAGÖZ from IMU Faculty of Engineering and Natural Sciences. With this project, a system was designed that allows reusing the sink water in the restrooms for toilet flushing to reduce water consumption in our campuses. The project goal for 2022 is to start implementing the system in all the restrooms in our campus area.



IMU Greywater Recovery System

Preventing Water System Pollution

Istanbul Medeniyet University cleans the wastewater inside the campus areas using certain **filtering systems** before discharging it. For instance, we have oil filters installed in the dishwashing sites in our campus kitchen and other facilities to prevent the oily wastewater from polluting the discharged water. These filters are regularly cleaned and the oil waste collected are delivered to ISTAC Inc., an affiliation of Istanbul Metropolitan Municipality that is in charge of waste management.

Free Drinking Water Provided

Istanbul Medeniyet University has started developing projects to provide free water for everyone as a human right. In 2021, we installed a water treatment system in our Ziraat Bank Library building to provide our campus community with free drinking water.

Water-Conscious Building Standarts

Istanbul Medeniyet University implements solutions to reduce water use in all its buildings and chiefly in its newly constructed buildings: photocell faucets in the washing basins, water saving recessed toilets etc.

LEADERSHIP

IMU

Prof.Dr. Erkan ŞAHİNKAYA, a faculty member of IMU Bioengineering Department, was appointed by Dr. Bekir PAKDEMİRLİ, the Minister of Agriculture and Forestry of the Republic of Turkey, as a **permanent member of the "Water Efficiency" group of the 1st Water Council**. As part of his duties in the Water Council, our faculty member has carried out studies aiming to identify the Ministry's short-term, medium-term, and long-term water strategies and light the way for the future in accordance with the Agricultural Council Regulation, which came into force in 2019 after being published in the Official Gazette.

LEARNING

IMU

Learning processes are key in achieving SDGs. Thus, universities play a critical role both by training professionals who will prioritize SDGs in their future practices and by increasing local, national, and global capacity to successfully achieve SDGs. As Istanbul Medeniyet University, we are fully aware of our critical role and thus aim to empower and motivate for SDGs not only our students through course contents, co-curricular activities, and student club activities, but also the community at large at a much wider scale. Therefore, we organize university-wide life-long learning activities, online courses, certificate programs, seminars, workshops, congresses, symposia, and panels that are open to all segments of society for participation. In 2021, we held a wide range of learning activities to ensure availability and sustainable management of water and sanitation for all.

Our University's Psychology Club organized an online event called **"Sustainable Living: Global Climate Change and Water Management"** on May 27, 2021. The speaker of the event was Prof.Dr. Erkan ŞAHİNKAYA from of our University. In this event, global climate change, which has become a major threat to the world, was addressed and aimed to raise awareness on this issue. In addition to climate change, topics such as water management and sustainable life were also discussed and the steps that people would take towards climate change were emphasized.

A workshop on energy preferences and their environmental costs was held on the second day of Istanbul Medeniyet University Sustainability Week events. **"ElectriCITY: Energy Preferences Game"**, a role game, which the participants produce energy policies as decision makers in the energy production of the city, was played at the workshop. The workshop was conducted by the Department of City and Regional Planning Res. Asst. Ayça ÇELİKBİLEK and geological engineer Gökhan SAPMAZ. At the beginning of the workshop, general information about the energy system and energy management used in cities was given. In this context, the participants were informed about primary energy sources such as fossil fuels, renewable energy sources and other energy sources. Finally, in order to understand why energy policies are important for the environment, information was given to the participants about air pollutants, greenhouse gases and water consumption resulting from source selection in energy production. Workshop coordinators informed that 51% of fresh earth water withdrawals are used for electricity. Thus, the participants were made to understand the importance of energy management in the global climate and water crisis. In the second part of the workshop, the game, which is a simple simulation of the energy system in cities, was introduced to the participants and the rules of the game were explained and the game started. The game, which was designed as a simulation of real life, was played as 6 different stages. And one of this stage is especially designed to provide a deep insight into the water consumption created by energy choices. Water consumption was kept at a certain limit in this stage and it was discussed how the changes in political, economic and environmental conditions reflected on the energy policies produced by the groups and how these policies were reflected on the environmental costs in addition to the construction and operating costs.

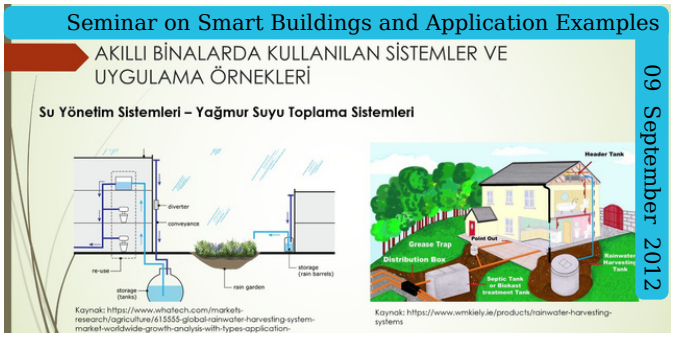
21 December 2021

Electricity: Energy Preferences Game

The 8th seminar of the **"Istanbul Urban Studies"** seminar series organized by the Department of Urban and Regional Planning was held online on June 2, 2021. The seminar Asst.Prof.Dr. Buğrayhan BİÇKİCİ ARIKAN of IMU Department of Civil Engineering with a presentation titled **"Osmanlı Devletinde Su Yapıları: İstanbul Örneği"** (Water Structures in the Ottoman Empire: The Case of Istanbul). BİÇKİCİ ARIKAN started her presentation by expressing that Istanbul, abounding with water-related structures, has struggled with water supply issues since the beginning of its history. She also mentioned that Istanbul has limited water resources and thus always had to provide fresh water supply systems from the surrounding regions. In this sense, Istanbul is one of the leading cities in water and water-related architectural structures, which have played a significant role in the city's history. The participants of the seminar discussed the possibility of water shortage and drought risk for Istanbul and how it can be managed in q/a session.

"Osmanlı Devletinde Su Yapıları: İstanbul Örneği" Seminar

The second seminar of the **"Mimarlık Araştırmaları"** (Architectural Studies) seminar series organized by Istanbul Medeniyet University, Department of Architecture, was held online on July 14, 2021, with the presentation of Res.Asst. Nazife SOFU BAĞ of the Department of Architecture. In her presentation titled **"Delhi and Housing Settlements"** SOFU BAĞ, discussed the development of the city of Delhi, and the problems arising from the impact of economic inequality on housing settlements. She stated that many slum areas were formed in the city. Also highlighted the problems caused by a lack of clean water resources and sanitary conditions in slums facing extreme poverty.



The fifth seminar of the **"Mimarlık Araştırmaları"** seminar series was held online on September 9, 2021 with the presentation of Res.Asst. Furkan ERUÇAR, from out Department of Architecture. In his presentation titled **"Akıllı Binalar ve Uygulama Örnekleri"** (Smart Buildings and Examples to Their Applications), ERUÇAR presented sections from the emergence and historical development of the concepts of smart cities and smart buildings. In the presentation, he mentioned the use of advanced technological systems such as water management systems, which are frequently used in smart buildings and provide a very high amount of savings. Also the importance of the use of graywater and black water in buildings was underlined. Finally he stated that in our world which is in danger of facing a huge water scarcity, water-use efficiency is becoming more and more important.

The seventh seminar of the **"Mimarlık Araştırmaları"** (Architectural Studies) seminar series was held online on October 21, 2021, with the presentation of Celal YILMAZ, MSc of IMU Department of Construction and Technical Works. In his presentation titled **"Akıllı Kentlerde Sürdürülebilir Su Yönetimi ve İstanbul"** (Sustainable Water Management in Smart Cities and the Case of Istanbul), YILMAZ discussed the global threat of water scarcity, the threat of water scarcity in Turkey, and the importance of the solutions developed for the problem. He also dealt with the significance of water planning in cities facing water scarcity and explained water management methods applied in smart cities. He then discussed the climatic water problems in Istanbul, as well as possible problems concerning irrigation and drinking water issues that may arise due to water scarcity in the near future. He also underlined the need for administrative measures against water scarcity and described the processes involved in the creation of a planning approach model he created for better water management in Istanbul.

RESEARCH

The academic staff members of our university carry out research on providing safe and affordable drinking water; ending open defecation and achieving access to sanitation and hygiene; improving water quality, wastewater management, and safe reuse of water; increasing water-use efficiency and ensuring supply of freshwater; implementing integrated water resources management; protecting and restoring water-related ecosystems; expanding support to developing countries in water- and sanitation-related activities; supporting local participation in improving water and sanitation management, publish the results of their research and share them with other researchers, decision-makers, stakeholders, and the public as a foundation for policies toward achieving SDGs.

A team of students from our Industrial Engineering Department including Şeyma DUYMAZ and Beyza Nur AYDOĞAN participated in the Future of Water Project Competition Final held at the ASELSAN campus on December 22, 2021 and received an award with their project called **"Artificial Intelligence Control of Water Losses in Dams"**. Our students' project aims to autonomously control water losses in dams using support vector machines, a machine learning technique. Data will be obtained by determining the factors causing water losses in the dam. Estimations will be based on high-dimensional and complex data classified with SVM and potential negative situations will be prevented with predictive maintenance. The project is different and innovative in that it is future-oriented, while current applications make instantaneous or retrospective analyses.With the help of this project it is aimed to maintain a better water management and prevent the creation of waste water.

22 December 2021

"Future of Water Project Competition" Awards Ceremony

Our Electrical and Electronics Engineering Department's students' project have been accepted by the "TÜBİTAK 2209-A–University Students Research Projects Support Program". The project is carried out in the Field Robotics Laboratory and support innovation in technology. The project titled **"Design and Implementation of Autonomous Surface Robot for Water Quality Monitoring"** and developed by Furkan SARIYILDIZ and Denizhan ARAS, aims at the electronic and software design and implementation of a low-cost unmanned surface autonomous robot. The developed robot will be able to perform the tasks assigned to it autonomously. The tasks will be followed simultaneously by the ground station software to be developed. In addition, the surface autonomous robot will make water quality mapping as a result of the measurements it makes.

Autonomous Surface Robot Project for Water Quality Monitoring

The book chapter titled **"An Analysis on Green Areas and the Potential of Irrigation Using Rainwater and Grey Water: A Case Study from the Megacity Istanbul"** has been published by Assoc.Prof.Dr. Yıldız AKSOY and Res.Asst. Özge GÜRSOY from our university. The book chapter is included in the book titled Contemporary Issues in Architecture and Urban Planning: Architectural and Urban Forms. The study highlights the importance of water-use efficiency for existing water resources and examines alternative water resources that can be used for irrigation needs of green spaces in Istanbul's Ataköy district. Rainwater collected from roofs and grey water collected from bathrooms were chosen as alternative water sources, and their efficiency was tested in the pilot urban housing area in the study. The findings revealed that rainwater and grey water are valuable resources for irrigation. Important and encouraging findings were achieved to identify alternative sources for the sustainability and efficiency of urban water supplies.

RESEARCH

Prof.Dr. ERKAN ŞAHİNKAYA from the Faculty of Engineering and Natural Sciences co-authored the article titled **"Sequential sulfur-based denitrification/denitritation and nanofiltration processes for drinking water treatment"** which was published in Journal of Environmental Management. Efficient and cost-effective solutions for nitrogen removal are necessary to ensure the availability of safe drinking water. This study proposes a combined treatment for nitrogen-contaminated groundwater by sequential autotrophic nitrogen removal in a sulfur-packed bed reactor (SPBR) and excess sulfate rejection via nanofiltration (NF). Dead-end filtration tests were performed with NF membranes to investigate the elimination of excess sulfate from the SPBR effluent. This study demonstrates that the combined process results in effective groundwater treatment and evidence that an adequately high nitrogen LR should be maintained to avoid the generation of excess sulfide.

Lect.Dr. A. Erkan UMAN from the Faculty of Engineering and Natural Sciences co-authored the article titled **"The NEWgeneratorTM non-sewered sanitation system: Long-term field testing at an informal settlement community in eThekwini municipality, South Africa"** which was published in Journal of Environmental Management. In the study, it was stated that there is a dire need for a new class of advanced non-sewered sanitation systems to provide onsite wastewater treatment that is capable of meeting stringent discharge or reuse criteria. These systems need to be simple to operate and maintain, reliable, and resilient to unreliable electrical service. The NEWgenerator is a compact, automated, solar-powered wastewater treatment system and operated at an informal settlement community in South Africa, treating high-strength blackwater and yellow water from a public toilet facility. The treatment levels met most of the ISO 30500 standard for liquid effluent and local water reuse criteria. This extended field trial under actual ambient conditions successfully demonstrated the feasibility of using this system to address the global water and sanitation crisis.

Lect.Dr. A. Erkan UMAN from the Faculty of Engineering and Natural Sciences co-authored the article titled **"Assessment of an Anaerobic Membrane Bioreactor (AnMBR) Treating Medium-Strength Synthetic Wastewater under Cyclical Membrane Operation"** which was published in Membranes. In this study, a lab-scale anaerobic membrane bioreactor combined with a tubular, cross-flow, PVDF ultrafiltration membrane was developed and operated to assess the long-term fouling behavior of a cyclically operated anaerobic membrane bioreactor (AnMBR). A stable membrane flux was maintained for 183 days without gas-lift, gas sparge, or chemical cleaning. Cyclical operation with frequent relaxation and periodic permeate backwash maintained stable membrane operation with a fouling rate of 0.007 kPa/h for the entire operating period. The comparison revealed frequent backwashing and relaxation is a sustainable strategy for operation of the AnMBR.

Lect.Dr. A. Erkan UMAN from the Faculty of Engineering and Natural Sciences co-authored a proceeding titled **"A Prototype Early Planetary Organic Processor Assembly (OPA) Based on Dual-Stage Anaerobic Membrane Bioreactor (AnMBR) for Fecal and Food Waste Treatment and Resource Recovery"** which was presented in 50th International Conference on Environmental Systems. In this study, to address the need of flight-ready technology capable of treating mixed organic wastes, creating a technology gap for future space missions, a prototype Organic Processor Assembly(OPA) was developed through collaboration between the University of South Florida(USF) and NASA's Kennedy Space Center(KSC). The OPA is based on the anaerobic membrane bioreactor (AnMBR), a hybrid technology coupling high-rate anaerobic digestion with membrane filtration. The system is designed for an early planetary base (EPB) scenario to aid in closing the resource recovery loop and decrease resupply dependence. This presentation discusses initial research pertaining to: 1) design challenges in maximizing hydraulic/organic throughput and Reliability, Availability, Maintainability, and Safety (RAMS) while minimizing mass and volume; 2) create capabilities for treating simulated high solids waste under steady and non-steady state conditions; and 3) measure solids performance parameter(s).