



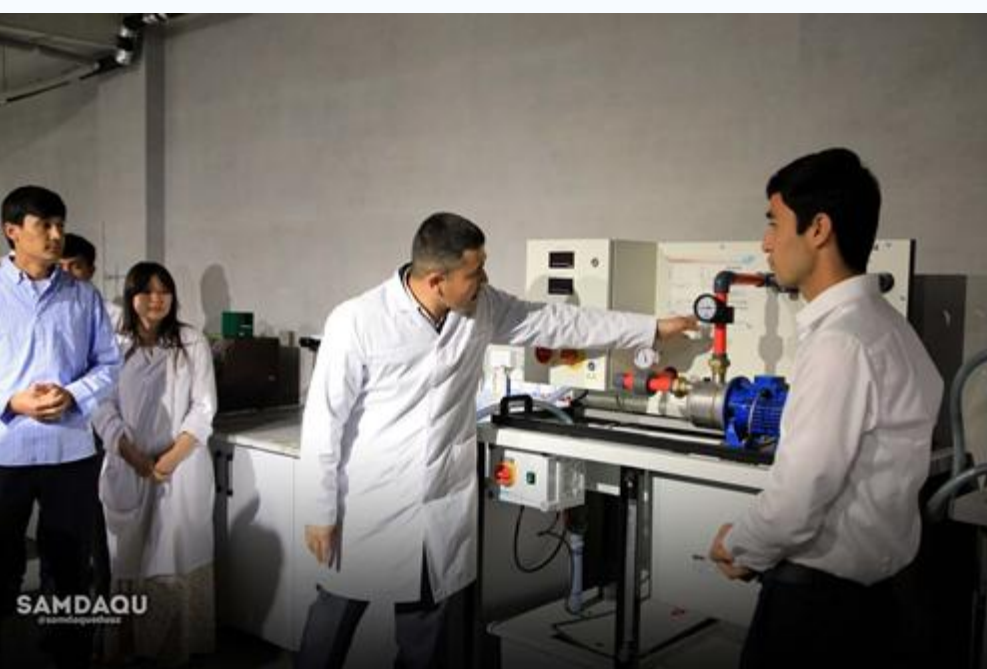
**SAMARKAND STATE ARCHITECTURE AND
CONSTRUCTION UNIVERSITY** named after
Mirzo Ulug'bek

Environmental Engineering

**“Building a Future with
Clean Water for All.”**

CONTINUE





Laboratory exercises

Department of Environmental Engineering at Samarkand State Architecture and Civil Engineering UniversityThe Department of Environmental Engineering is one of the leading academic and research units at Samarkand State Architecture and Civil Engineering University (SamSAOU). The department is dedicated to training highly qualified specialists in the fields of environmental protection, ecological sustainability, water resources management, and environmental engineering. Currently, the department employs 22 academic staff members, including 3 Doctors of Science (DSc) and 5 PhD holders. The faculty members possess strong academic backgrounds and extensive professional experience, contributing actively to both education and research aimed at promoting sustainable development and environmental safety. Throughout 2024, the department's professors and researchers published around 30 scientific articles in prestigious national and international journals. These publications focused on topics related to aquatic ecosystems, sustainable water resource management, ecological balance, and environmental protection. Their research plays an essential role in improving water resource management systems in Uzbekistan, addressing environmental challenges in the Aral Sea region, and promoting long-term water sustainability. The department also encourages student and young researcher participation in scientific projects, international conferences, and environmental initiatives, strengthening academic collaboration and innovation in sustainability science. Through its teaching and research activities, the Department of Environmental Engineering continues to make significant contributions toward achieving United Nations Sustainable Development Goal 6 (Clean Water and Sanitation) — ensuring availability and sustainable management of water and sanitation for all.



To date, the staff of the Department of Environmental Engineering have published over 2,000 scientific articles and theses, including 20 authorship certificates and patents. The department's faculty members actively participate every year in various scientific and practical conferences at national and international levels, delivering presentations and sharing research outcomes. Notably, the department has organized international and national scientific-practical conferences in 1993, 1996, 2004, 2007, 2010, 2014, and 2020. In 2014 and 2015, the department hosted republican scientific-practical conferences on engineering communications development and environmental issues, which were attended by scientists and specialists from across Uzbekistan and CIS countries. In 2012, the department established international scientific relations with foreign institutions, including Italy's Pump Manufacturing Company, Kyiv National University of Construction and Architecture (Ukraine), Moscow and St. Petersburg State Universities of Civil Engineering (Russia), and the Institute of Railway Engineers. Collaborative work has been carried out in several scientific and technical areas. The department successfully won an international Tempus project grant titled "UZ Water – Water Resource Management", which involves scientific and practical collaboration between partner countries — Sweden, Poland, Latvia, Lithuania, and Uzbekistan. The project aims to enhance research capacity and promote sustainable management of water resources.

EDUCATIONAL PROGRAMS OFFERED BY THE DEPARTMENT

Bachelor's Programs:

- 60713400 – Environmental Engineering
- 60730500 – Design and Operation of Water Supply and Sewerage Systems
- 60730400 – Construction and Installation of Engineering Communications
- 60112400 – Professional Education (Engineering Communications)
- 60710400 – Ecology and Environmental Protection (by sectors and fields)

Master's Programs:

- 70710404 – Wastewater Treatment and Water Resources Protection
- 70730401 – Construction and Installation of Engineering Communication Networks

PhD Academic Council The PhD Scientific Council No. 26/26.01.2023.T.109.03 awards scientific degrees in the following specializations:

- 05.09.04 – Water Supply, Sewerage, and Water Protection Engineering Systems
- 05.09.06 – Hydraulic Engineering and Land Reclamation Construction
- 05.09.07 – Hydraulics and Engineering Hydrology

Water system

At our university, there are specially equipped laboratory facilities that allow students—including master's and doctoral candidates—to participate in research activities alongside professors and academic staff. Additionally, the laboratory hosts high-level specialists who conduct forecasts on the use of water resources in our country.

Currently, several doctoral students, under the guidance of their academic supervisors, are actively engaged in studying various types of drinking and wastewater and introducing innovative technologies into the field.

6.3.1 Key Facility in Samarkand Region:

Facility Name: Wastewater Treatment Plant under “Samarkand Water Supply” LLC

Location: Samarkand City

Function: Treatment of municipal wastewater and water recycling through technological processes

Partnerships: “Uzsuvta’minot” JSC, World Bank, Government of Switzerland, Korea Water Resources Corporation

Objective: To enhance efficiency and ensure environmental safety through modern technologies.

Samarkand State University of Architecture is home to leading experts in this field, and its doctoral students are currently implementing several innovative technologies at this facility. In the wastewater laboratory, physical, chemical, and biological indicators are analyzed—playing a crucial role in determining the level of pollution and selecting appropriate treatment technologies.

University specialists analyze the following key indicators:

1. Physical Indicators:

- Color:** Visual changes in water appearance
- Turbidity:** Amount of suspended particles in the water
- Temperature:** Affects biological activity
- Odor:** Indicates organic or chemical contamination

2. Chemical Indicators:

- pH Level:** Indicates whether the water is acidic or alkaline
- Biochemical Oxygen Demand (BOD):** Amount of oxygen required by microorganisms to decompose organic matter
- Chemical Oxygen Demand (COD):** Amount of oxygen required by chemical agents to oxidize organic substances
- Ammonium, Nitrate, Nitrite:** Nitrogen compounds indicating the level of contamination

Heavy Metals (e.g., lead, cadmium, mercury): Originate from industrial waste

Phosphates: Pollution resulting from detergents and fertilizers

3. Biological Indicators

- Microorganisms (E. coli, coliform bacteria):** Used to assess hygienic safety
- Parasites:** May pose health risks

Purpose of Analysis

- Designing wastewater treatment facilities**
- Verifying compliance of discharged water with environmental standards**
- Assessing the ecological impact of industrial processes**



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3	Jo`rayev Olmos Joniqulovich	Qodirova Adolat O`razali qizi	3	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	23BBA1098867QA
4.	Yakubov Kutfidin Asliyevich	Abdullayev Muhammadali Rustamjonovich	3	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	23BBA1091489AM
5.	Nigmatov Mirzabahrom Karimovich	Tolibov Muzaffar Bahramovich	3	01.02.05-“Suyuqlik va gaz mexanikasi”	Atrof muhit muhandisligi	UZ050
6.	Gadayev Abror Niyazovich	Usanova Sevara Abdivayitovna	2	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	6419710239131271
7.	Bazarov Dilshod Rayimovich	Tadijyeva Durdona Oblaqulovna	1	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	24BBA1219500TD
8.	Norqulov Bahodir Musulmanovich	Togayev G`ulom	3 (Mustaqil izlanuvchi)	01.02.05-“Suyuqlik va gaz mexanikasi”	Atrof muhit muhandisligi	Yo`q
9.	Norqulov Bahodir Musulmanovich	Arziyev Jamoliddin	3 (Mustaqil izlanuvchi)	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	Yo`q
10.	Nigmatov Mirzabahrom Karimovich	Boboyeva Gulmira Sodiqovna	2 (Mustaqil izlanuvchi)	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	Yo`q
11	Gadayev Abror Niyazovich	Anorboyev Sohıb Asror o`g`li	2 (Mustaqil izlanuvchi)	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	Yo`q
12	Norqulov Bahodir Musulmanovich	Suvonov Obid SHukurulloyevich	2 (Mustaqil izlanuvchi)	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	Yo`q
13.	Jo`rayev Olmos Joniqulovich					
14.		Alladustov Ulug`murod	1 (Mustaqil izlanuvchi)	05.09.04 – “Suv ta’minoti.Kanalizatsiya.Suv havzalarini muhofazalovchi qurilish tizimlari”	Atrof muhit muhandisligi	Yo`q
15.	Latipov Shaxboz Alisher o`g`li	Dustov Aziz Yusufovich	1 (Mustaqil izlanuvchi)		Atrof muhit muhandisligi	Yo`q

Water system

During this academic year, the Department of Environmental Engineering admitted 10 students on a scholarship basis and 9 students on a tuition-contract basis. Additionally, 8 second-year master's students are actively working on large-scale innovative scientific projects under the supervision of their academic advisors.

The table below presents the main equipment used in university laboratories for water resources and wastewater research, along with their measurement functions and units. These instruments are utilized to assess water quality, determine pollution levels, and conduct hydrotechnical investigations.

Unit name	Measurement function	Units of measurement / quantity
pH meter	Determining the alkaline or acidic state of water	pH (range 0–14)
Turbidimeter	Measuring water turbidity	NTU (Nephelometric Turbidity Unit)
Conductometer	Determining the electrical conductivity of water	$\mu\text{S}/\text{cm}$ (microsiemens/centimeter)
Spectrophotometer	Determination of the concentration of chemicals in water	mg/l or ppm
BOD incubator	Determination of Biological Oxygen Demand (BOD)	mg/l (5-day test)
TDS meter	Measuring total dissolved solids	ppm (parts per million)
Water level gauge (nivometer)	Water level detection	sm, m
Manometer	Pump pressure measurement	bar, Pa
Laboratory pump	Water sample conversion and filtration	l/min (liter/minute)
Filter flask and vacuum pump	Water filtration and particle separation	micron level filtration
Refractometer	Determining the concentration of solutions in water	% or refractive index
Water temperature sensor	Measuring water temperature	$^{\circ}\text{C}$ (degrees Celsius)





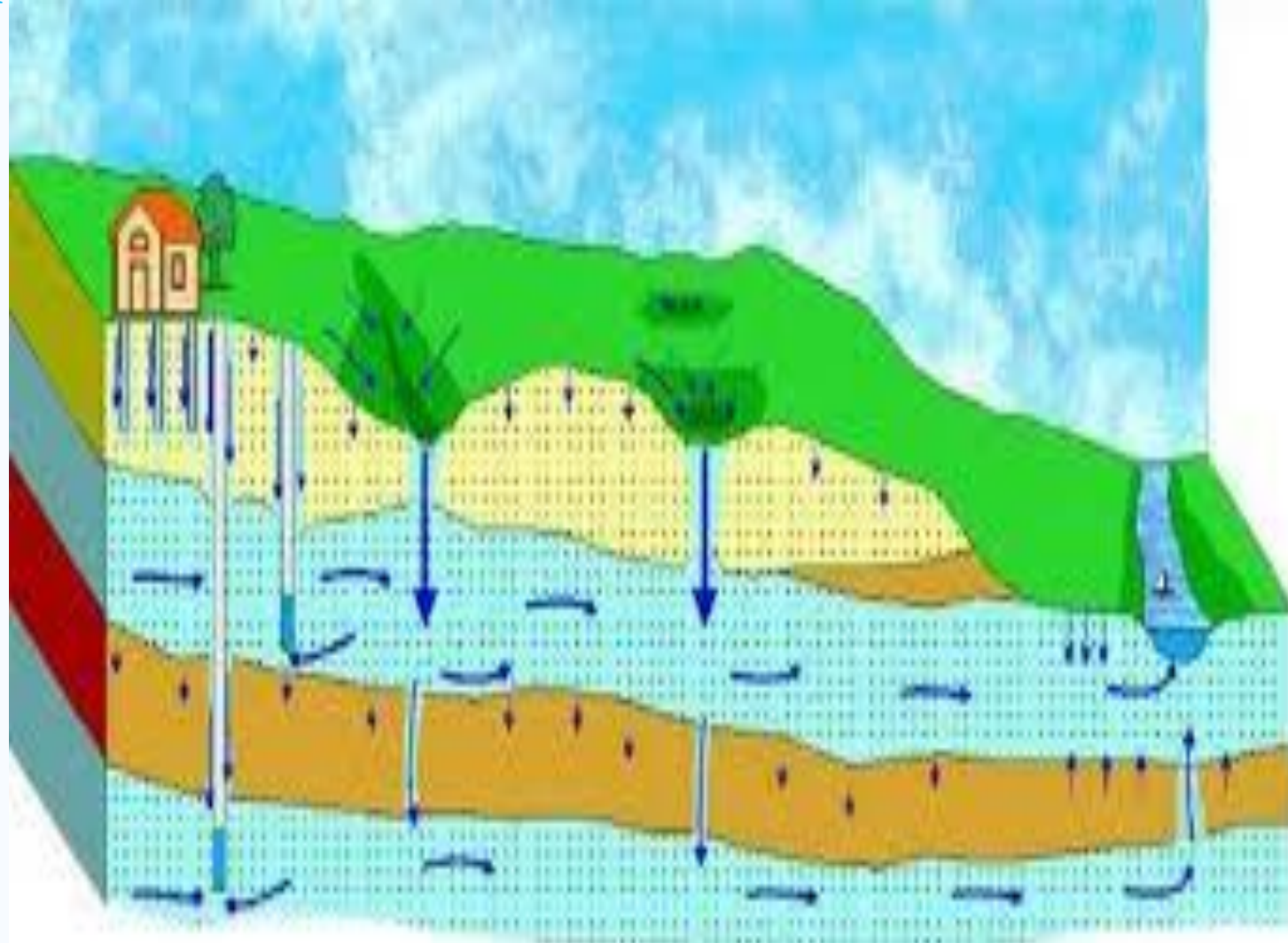
Water system

6.3.3 Drinking Water

In the Samarkand region, drinking water is primarily sourced from underground water through wells. Additionally, Samarkand State University of Architecture and Construction (SamDAQU) independently manages its own drinking water supply needs. Various water quality parameters are regularly analyzed in the laboratory.

To ensure water continuity, several 20 m³ iron-structured storage tanks have been installed. Each room in the academic building is equipped with modern hot and cold water systems. There are clean drinking water fountains located throughout the university campus, providing convenience for students, faculty, and visitors alike.

The total volume of water used for drinking and irrigation purposes at the university amounts to 135,000 cubic meters. More than 2,500 trees and over 8,000 square meters of green lawn have been planted across the campus. The majority of the trees are drought-resistant species. Around 50 fruit trees and approximately 30 ornamental tree varieties have also been planted.



In the Samarkand region, groundwater is primarily used for drinking and agricultural purposes. In Uzbekistan as a whole, a significant portion of groundwater is utilized for irrigation and is extracted through pumping stations and wells.

Composition and Characteristics of Groundwater in the Samarkand Region

Water Sources: In Samarkand, groundwater is drawn from aquifers located in the Zarafshan Valley, foothill areas, and lowland plains.

Composition:

- Mineralization level:** 0.3–1.0 g/l (suitable for drinking)
- pH level:** 6.5–8.0 (neutral or slightly alkaline)
- Salt content:** Includes carbonates, sulfates, and chlorides
- Microbiological condition:** Must meet sanitary standards

Characteristics:

- Water suitable for drinking is mainly extracted from wells located in foothill areas
- Groundwater from lowland regions is primarily used for technical and irrigation purposes

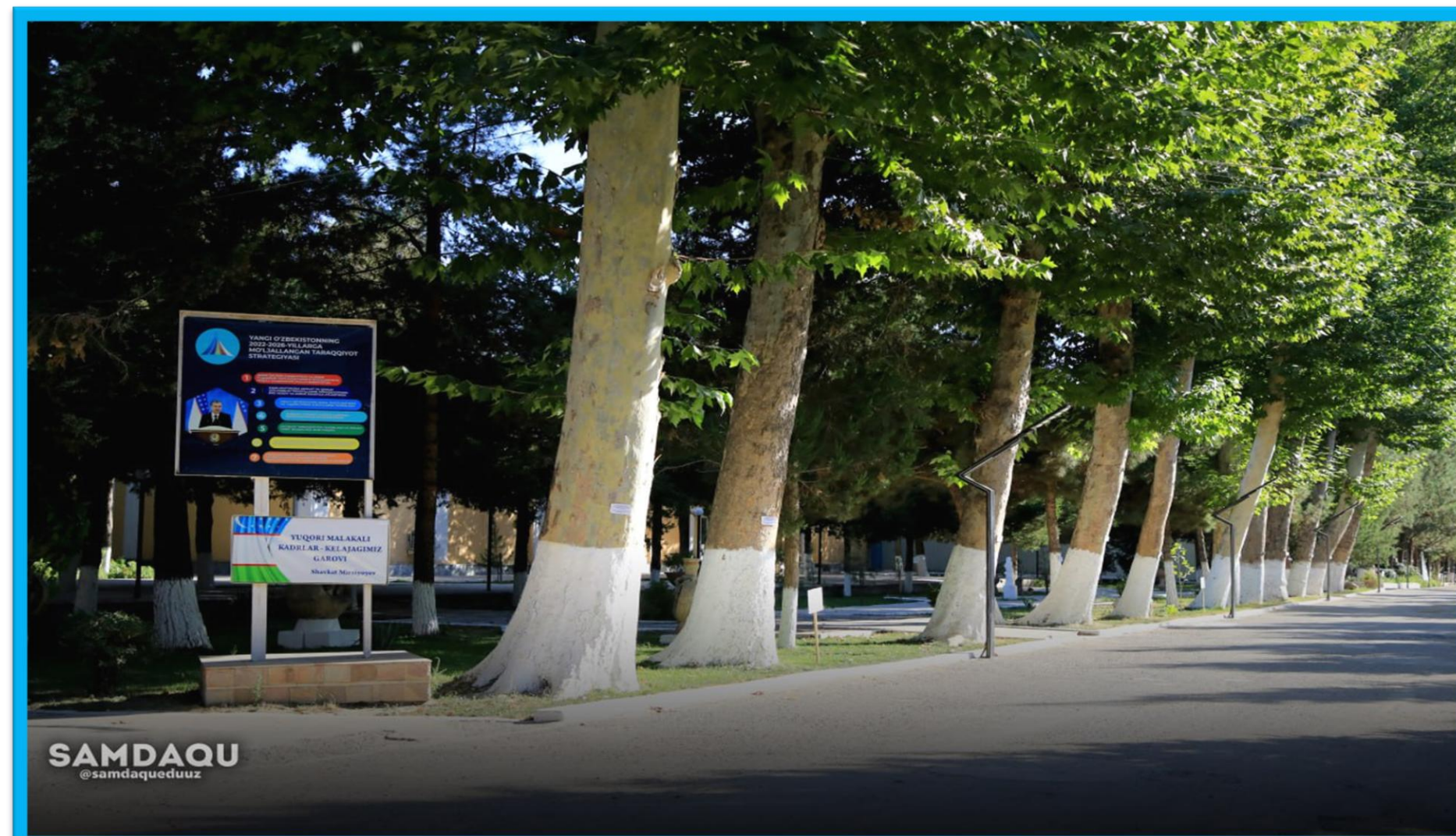
Groundwater Wells and Pumping Stations in Uzbekistan

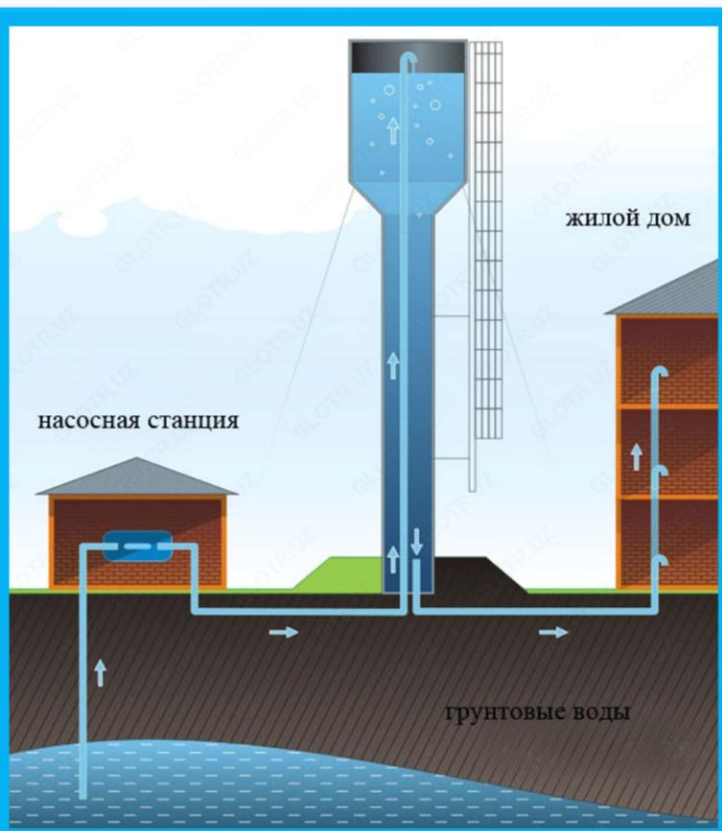
Number of Wells:

There are thousands of groundwater wells across Uzbekistan, managed by “Uzsuvta’minot” JSC and local enterprises.

Pumping Stations:

- Types:** Centralized (for urban areas) and local (for rural areas)
- Locations:** Numerous stations operate in regions such as Samarkand, Bukhara, Kashkadarya, and the Fergana Valley





 **Technical Specifications**
Pump capacity: 5–50 liters per second
Depth range: 30–250 meters
Well types: Artesian, filtered, and pressurized
Monitoring: Since 2024, all pumps have been equipped with metering devices

11,000+

Number of
pumping
stations

22,0000+

Number of
active wells

**Samarqand
Qashqadaryo
Farg'ona**

Regions with
the highest
number of
pumping
stations

Main directions of water consumption

85% Agriculture

15% Drinking
water

5% Industrial
technician



Water system

6.3.4 Construction Standards for Water Resource Utilization

Construction standards for water resource utilization are applied in universities. These standards are based on the building codes and sanitary regulations of the Republic of Uzbekistan.

Construction Standards and Water System Schematics

The following water systems and their dimensions are typically used in university buildings:

1. Drinking Water Distribution System

- **Pipe diameter:** 25–100 mm
- **Materials:** Galvanized steel, polypropylene (PPR), polyethylene (PE)
- **Pressure level:** 3–6 bar

2. Wastewater Drainage System

- **Pipe diameter:**
 - 50 mm (sink)
 - 110 mm (toilet)
 - 160 mm (main collector)
- **Materials:** PVC or HDPE
- **Slope:** 1–2% (for gravity flow of wastewater)

Drinking Water Layout

- **Inlet point:** Ø50 mm
- **Branching:** Ø25 mm (rooms), Ø32 mm (laboratories)
- **Pump platform dimensions:** 1.5 m × 1.2 m
- **Water reservoir:** 2 m³ volume, 1.5 m height

Wastewater Layout

- **Toilet outlet:** Ø110 mm
- **Sink outlet:** Ø50 mm
- **Connection to collector:** Ø160 mm
- **Inspection well:** Every 25 meters

Water Consumption Standards per Person

According to the construction norms of the Republic of Uzbekistan, the following water consumption standards are applied in universities:

QMQ 2.04.01-97 — Drinking Water Supply

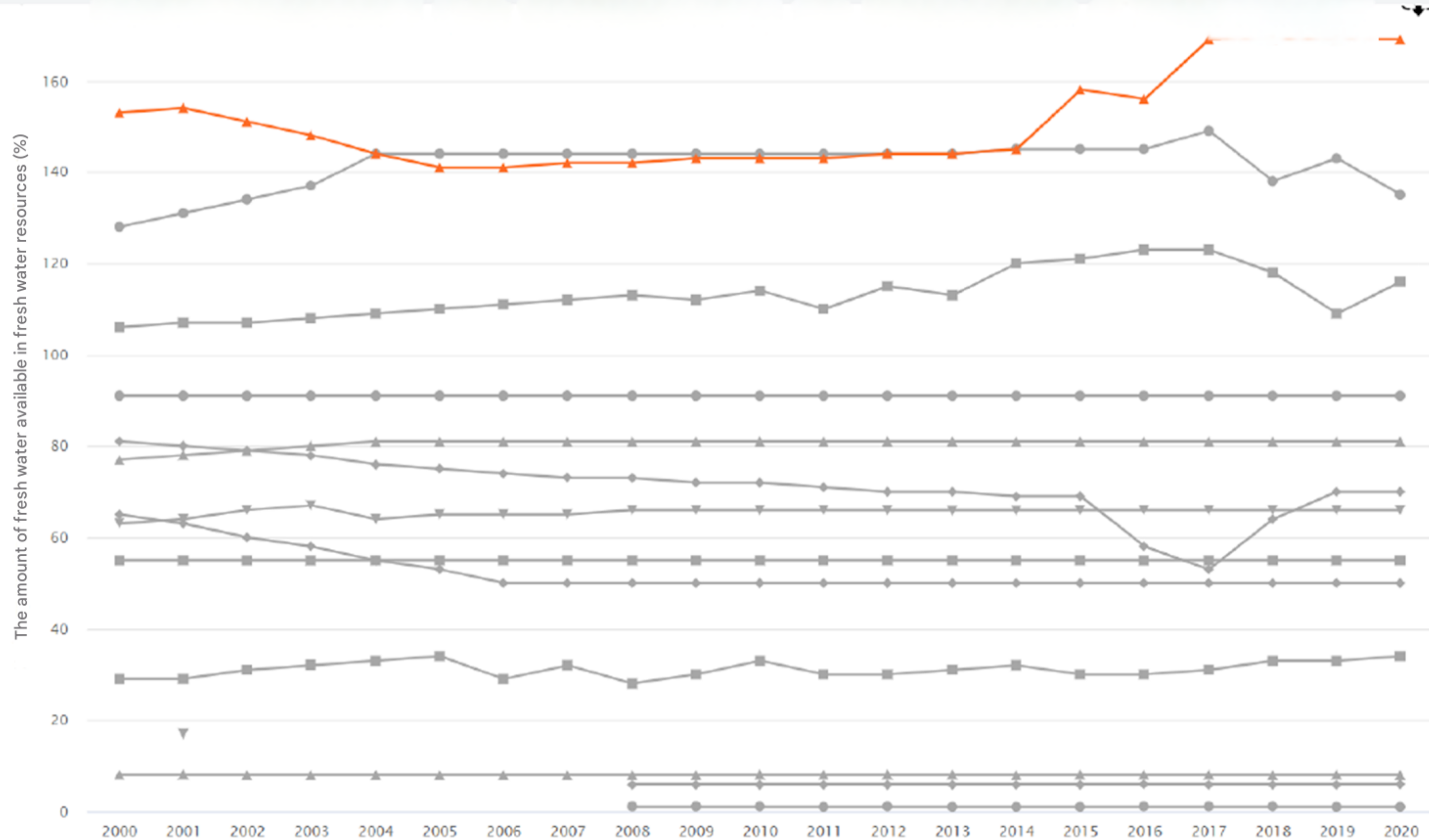
- **Pressure requirements:** Between 2.5 and 6 bar
- **Pipe materials:** Galvanized steel, polyethylene (PE), polypropylene (PPR)

QMQ 2.04.02-97 — Wastewater System

- **Pipe diameters:**
 - 50 mm (sink)
 - 110 mm (toilet)
 - 160 mm (main collector)
- **Slope:** 1–2% (for gravity flow)
- **Inspection wells:** Installed every 25–30 meters

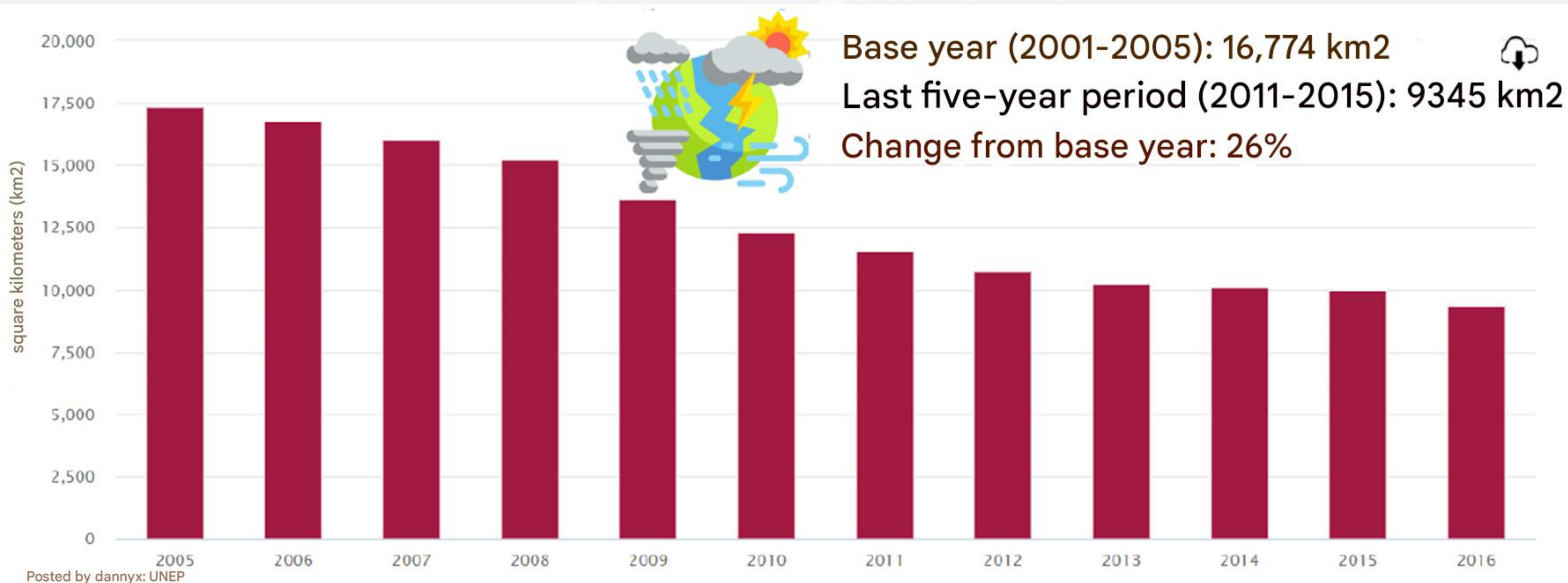


6.4.2 Water stress level: Freshwater withdrawal as a share of available freshwater resources in Uzbekistan, changes over time relative to other countries (and districts) in the region



Water-related ecosystems

Changes include increases and decreases in surface water, which correspond to floods and droughts and are often associated with climate change. Lakes, rivers and artificial reservoirs



Water system



6.4.1 The Application of Modern Water Resource Management Technologies at the University
The use of modern technologies for managing water resources is increasingly being implemented at the university. For example, water consumption for landscaping can now be controlled via mobile devices. This project is part of the master's thesis of university graduate student Qamarov Asadbek Zafar ogli.

Additionally, the university has been offering convenient and modern solutions for water resource utilization across the city of Samarkand for many years. Most importantly, within the framework of international cooperation, our university has been carrying out large-scale projects in the Aral Sea region of Karakalpakstan in collaboration with Chinese universities. Furthermore, innovative projects developed by master's and doctoral students are attracting the interest of pump-operating companies, leading to the signing of contracts with investors such as “GRANDFAR” and “GIDROMAKS.”

The Department of Environmental Protection has also published numerous internationally recognized articles in SCOPUS-indexed journals. Moreover, at internationally organized events such as “INNOWEEK: Borderless Ideas” and “SOFEXPO,” which are designed for investors and young startups, the innovative projects of SamDAQU master's and doctoral students are receiving positive attention.





6.4.2 Specialized Laboratory and International Collaboration on Water Resources

The university hosts a specialized laboratory where not only water intended for university consumption is analyzed, but also samples from water facilities supplying various districts are examined. These districts include Samarkand, Oqdaryo, Nurobod, Ishtixon, Bulungur, Jomboy, and Payariq.

Additionally, the university annually organizes various international conferences. During these events, highly qualified local and international experts analyze challenges and propose solutions related to water resource management.

Our professors and doctoral students have delivered lectures to Chinese audiences on the utilization of water resources in Central Asia and global sources. Experts from various countries also visit the university to engage in knowledge exchange. For example, an open discussion on local and global environmental sustainability was held with John Capecese from the University of Florida.



Innovative Technologies for Environmental Protection Discussed

An international scientific and technical conference on “Innovative Technologies in Environmental Protection” was held at the Mirzo Ulugbek Samarkand State Architectural and Construction University. The event brought together leading experts in the field, foreign and local scientists, doctoral candidates, and young researchers.

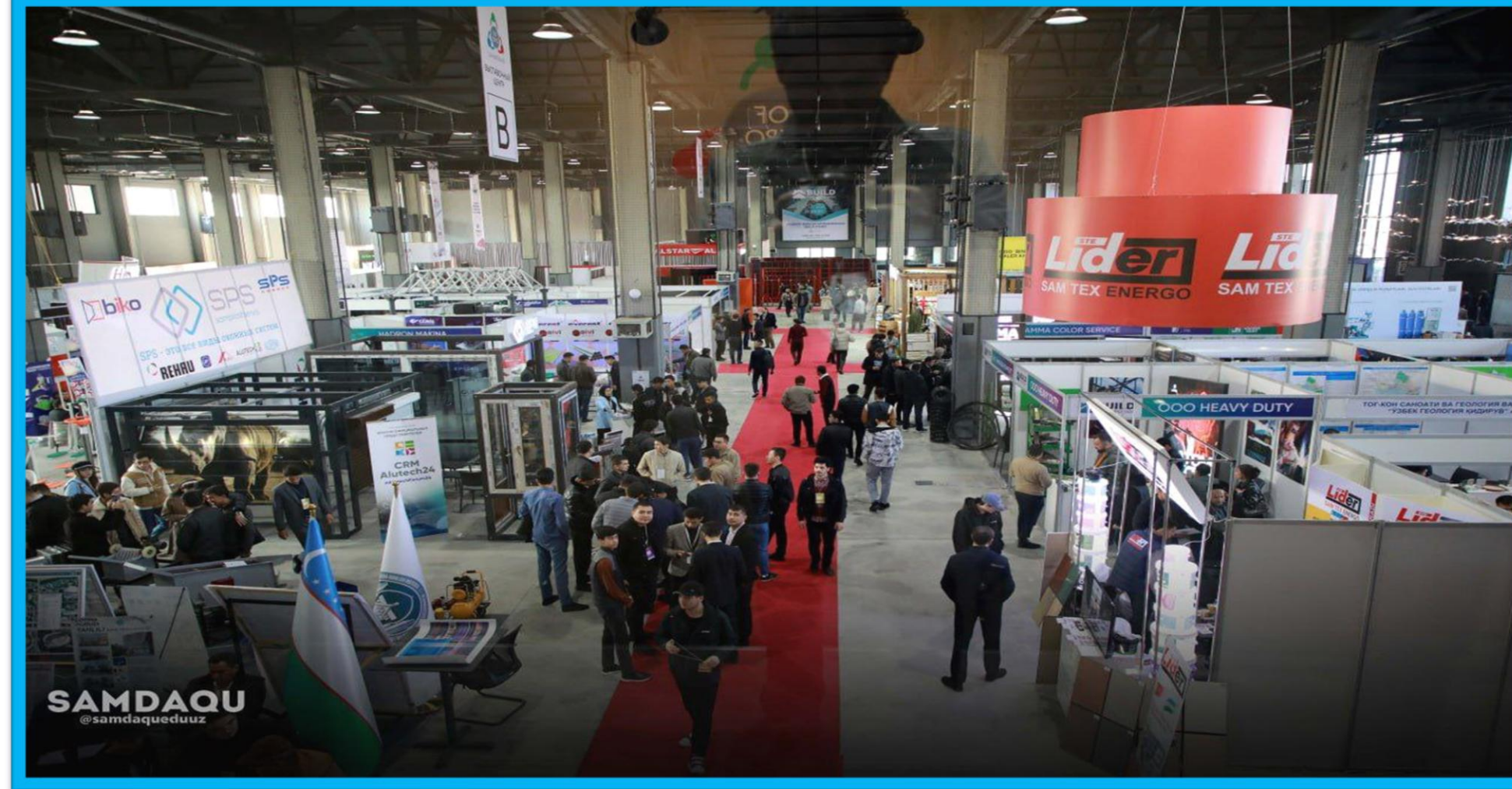
Presentations and discussions were organized around the following key areas:

- Monitoring of environmental and climate change
- Development of green energy through waste recycling
- Innovative technologies and artificial intelligence in water resource protection
- Challenges in training specialists in the field of environment and climate change
- Ecological protection technologies in architecture and construction

Let me know if you'd like this adapted for a press release or academic summary.

On November 8, 2024, competitions were held in the following categories:

- “Modern Technological Solutions for Water Saving” (models and prototypes)
- “Smart Technologies for Supplying the Population with Clean Drinking Water” (scientific idea presentation)
- “Water is Life” (photo exhibition)

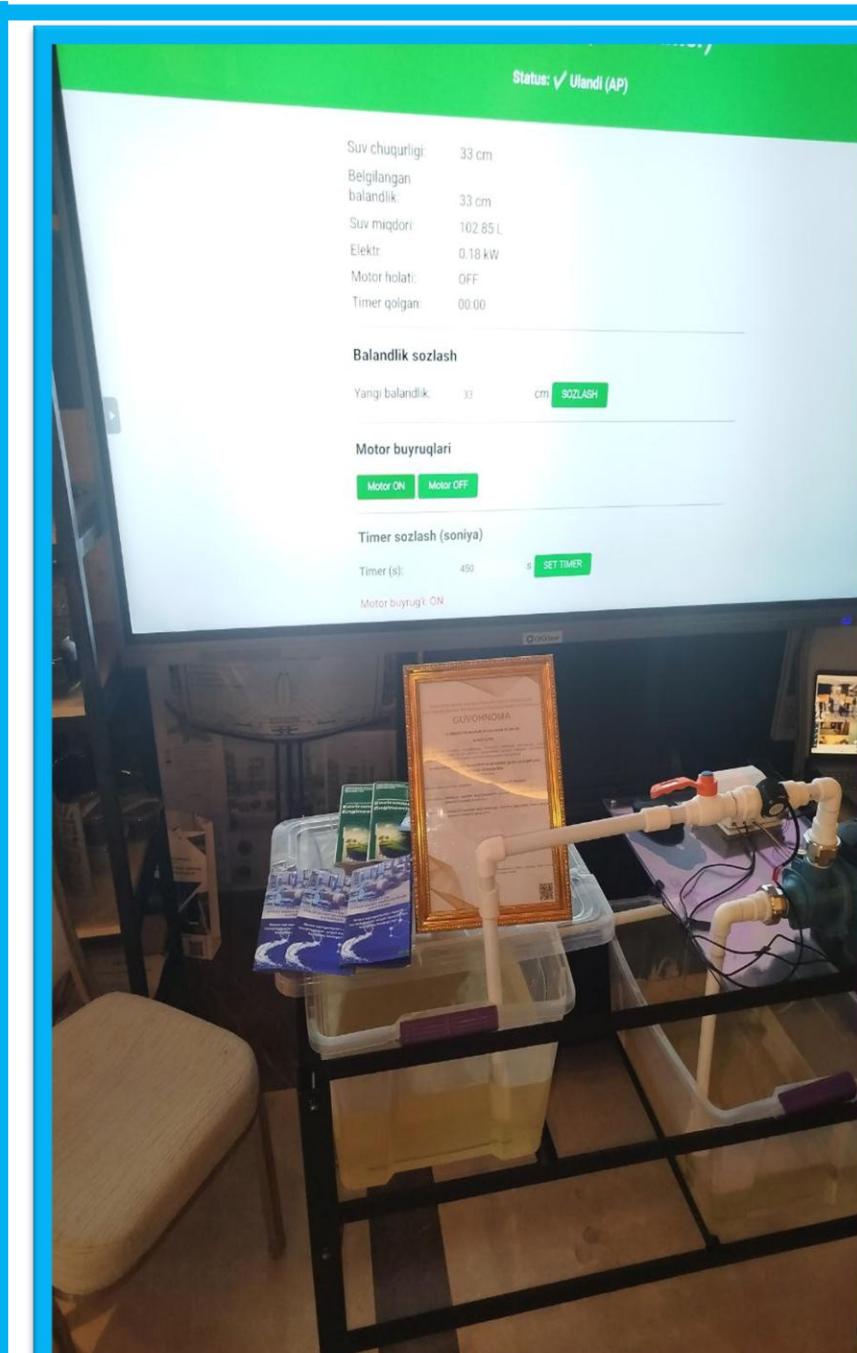


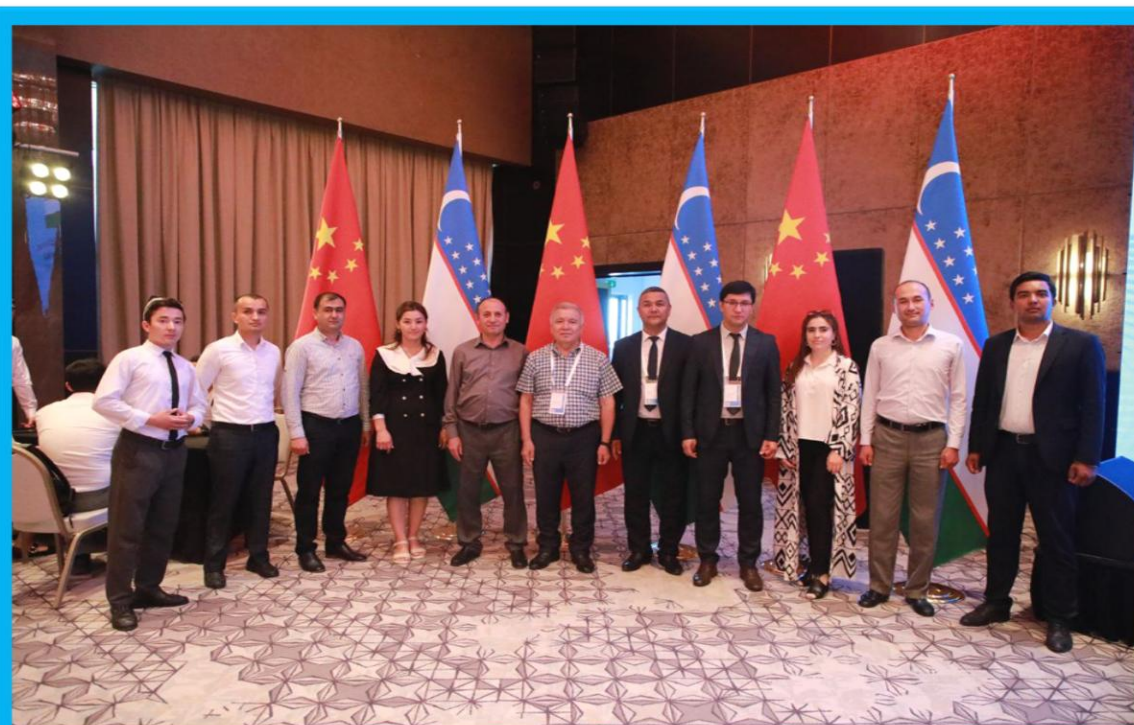
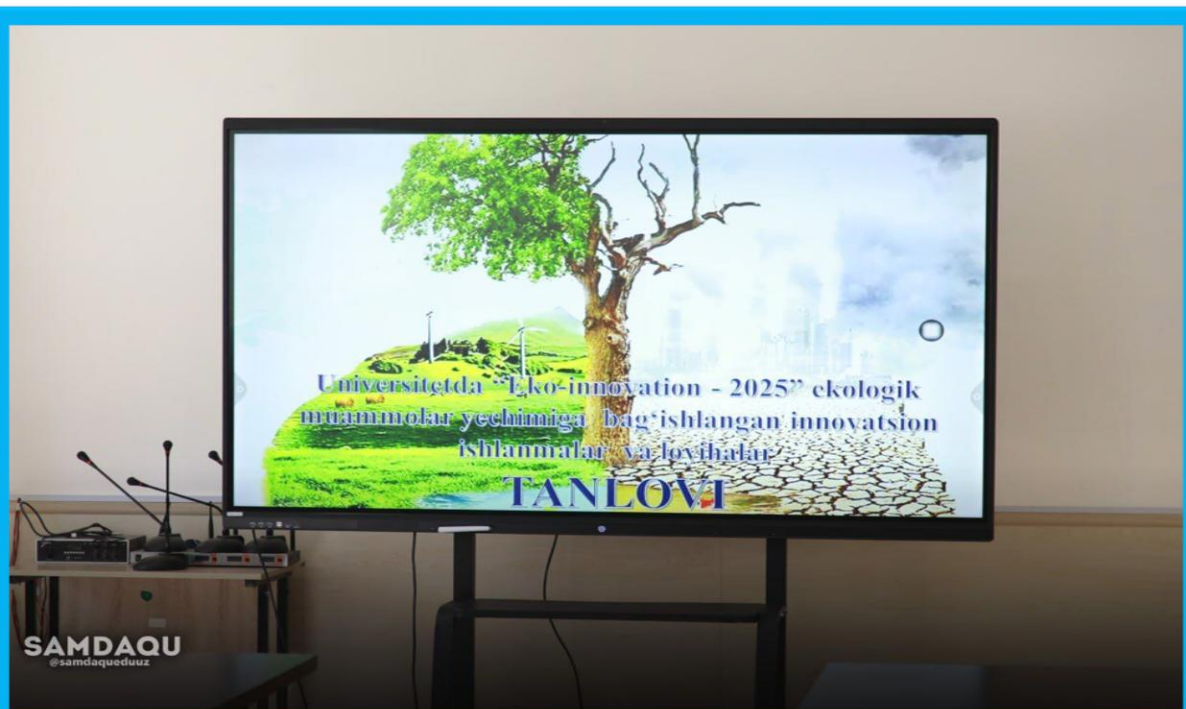


During the conference, valuable proposals and recommendations were made regarding environmental sustainability, the application of innovative technologies, and reducing the impact on the environment. This international forum serves to advance scientific research in the field of environmental studies, find science-based solutions to ecological problems, and strengthen the exchange of experience.

6.5.4

There are several stable water intake facilities on the university campus that provide a continuous supply of water.





At the university, conferences on the proper use of water resources are organized, along with award-based competitions aimed at encouraging student interest and enthusiasm. Additionally, our master's student Qamarov Asadbek Zafar ogli has developed an application for integrated water supply management and monitoring. This technology has shown promising application in the irrigation systems of Samarkand, Sirdaryo, and Jizzakh regions.

Moreover, SamDAQU has a large number of young people proficient in foreign languages, and lectures are organized with international experts in environmental engineering. As part of a 3-month program, nine English-speaking master's students participated in the "Sustainable Development and Sustainability Science" (SDSS) initiative and earned international academic credits.

"Web of science" "Scopus" "Google academy"

1 Norqulov Bahodir Musulmonovich 1983 asosiy Atrof muhit muhandisligi Kafedra mudiri erkak PhD dotsent <https://www.webofscience.com/wos/author/record/HKO-3166-2023> <https://www.scopus.com/authid/detail.uri?authorId=57222365502> https://scholar.google.ru/citations?hl=ru&user=0-b5IGUAAAAJ&view_op=list_works&sortby=title

2 Gadayev Abror Niyazovich 1959 ichki Atrof muhit muhandisligi Kafedra professori erkak PhD professor <https://www.scopus.com/authid/detail.uri?authorId=55920834000> <https://scholar.google.com/citations?user=QbogFU8AAAAJ&hl=ru>

3 Jurayev Olmos Joniqulovich 1957 asosiy Atrof muhit muhandisligi v.b. professor erkak PhD dotsent <https://scholar.google.ru/citations?user=3S3pi00AAAAJ&hl=ru&oi=sra>

4 Yakubov Kutfidin Asliyevich 1954 asosiy Atrof muhit muhandisligi v.b. professor erkak PhD dotsent <https://scholar.google.com/citations?user=L5Sp3IsAAAAJ&hl=ru>

5 Mirzayev Abdialim XXX 1953 asosiy Atrof muhit muhandisligi dotsent erkak PhD dotsent <https://scholar.google.com/citations?user=YkoNUx0AAAAJ&hl=ru>

6 Saidov Salim Saidovich 1953 asosiy Atrof muhit muhandisligi dotsent erkak PhD dotsent <https://scholar.google.com/citations?user=3S3pi00AAAAJ&hl=ru>

7 Xalilov Ni'matillo XXX 1955 asosiy Atrof muhit muhandisligi katta o'qituvchi erkak PhD mavjud emas <https://scholar.google.com/citations?user=UvDuoxUAAAAJ&hl=ru>

8 Nurmatov Panji Abdumuratovich 1980 asosiy Atrof muhit muhandisligi v.b. dotsent erkak PhD mavjud emas <https://www.webofscience.com/wos/author/record/39666066> <https://www.scopus.com/authid/detail.uri?authorId=57218419377> <https://scholar.google.ru/citations?user=-3mHYwAAAAJ&hl=ru>

9 Kurbonova Umida Utirovna 1982 asosiy Atrof muhit muhandisligi katta o'qituvchi ayol PhD mavjud emas <https://www.scopus.com/authid/detail.uri?authorId=57209308074> <https://scholar.google.com/citations?user=DhTSBKoAAAAJ&hl=ru>

10 Jurayev Anvar Haydar o'g'li 1990 asosiy Atrof muhit muhandisligi katta o'qituvchi erkak PhD mavjud emas <https://www.scopus.com/authid/detail.uri?authorId=58855596000> <https://scholar.google.com/citations?user=YZb58JkAAAAJ&hl=ru>

11 Alladustov Ulug'murat Baxriyevich 1957 asosiy Atrof muhit muhandisligi katta o'qituvchi erkak mavjud emas mavjud emas <https://scholar.google.com/citations?user=HG5NP7gAAAAJ&hl=ru>

12 Boboyeva Gulmira Sadikovna 1961 asosiy Atrof muhit muhandisligi v.b. dotsent ayol mavjud emas mavjud emas <https://www.scopus.com/authid/detail.uri?authorId=55921041300> <https://scholar.google.com/citations?user=KG56NqQAAAAJ&hl=ru>

13 Xushvaktov Buta Oralovich 1968 asosiy Atrof muhit muhandisligi v.b. dotsent erkak mavjud emas mavjud emas <https://scholar.google.com/citations?user=uhrrrFwAAAAJ&hl=ru>

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15 Tadiyeva Durdona Oblakulovna 1987 ichki Atrof muhit muhandisligi katta o'qituvchi ayol mavjud emas mavjud emas <https://www.scopus.com/authid/detail.uri?authorId=57219312100> <https://scholar.google.ru/citations?user=epxP4CcAAAAJ&hl=ru>

16 Axmedova Feruza Isanovna 1969 asosiy Atrof muhit muhandisligi o'qituvchi ayol mavjud emas mavjud emas https://scholar.google.com/citations?user=n_fPZdUAAAAJ&hl=ru

17 Artikboyev Xusniddin Baxriddinovich 1992 asosiy Atrof muhit muhandisligi o'qituvchi erkak mavjud emas mavjud emas <https://www.webofscience.com/wos/author/record/38581028> <https://scholar.google.com/citations?user=0mUteTMAAAAAJ&hl=ru>

18 Ganiyeva Dilnora Umirzakovna 1989 asosiy Atrof muhit muhandisligi o'qituvchi ayol mavjud emas mavjud emas <https://scholar.google.com/citations?user=S6EHCP8AAAAJ&hl=ru>

19 Sobirova Dildora Almaxammadovna 1987 asosiy Atrof muhit muhandisligi o'qituvchi ayol mavjud emas mavjud emas <https://scholar.google.com/citations?user=4rF0qLgAAAAJ&hl=ru>

20 Zokirov Ma'ruf Zokirjonovich 1990 asosiy Atrof muhit muhandisligi o'qituvchi erkak mavjud emas mavjud emas <https://www.webofscience.com/wos/op/publications/add-suggested-publications> <https://www.scopus.com/home.uri> <https://scholar.google.com/citations?user=hawequEAAAAJ&hl=ru>

21 Mirzayev Murod Namazovich 1986 asosiy Atrof muhit muhandisligi o'qituvchi erkak mavjud emas mavjud emas <https://scholar.google.ru/citations?user=q5wKo4AAAAAJ&hl=ru>

22 Nodirov Dilshod Murodullayevich 1988 asosiy Atrof muhit muhandisligi o'qituvchi erkak mavjud emas mavjud emas <https://scholar.google.com/citations?user=PtQVhZAAAAAJ&hl=ru>