

İSTANBUL WATER AND SEWERAGE ADMINISTRATION
İSTANBUL SU VE KANALİZASYON İDARESİ



WATER SAFETY IN TURKEY

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İSTANBUL METROPOLITAN MUNICIPALITY Slayt 1/60

İSTANBUL WATER AND SEWERAGE ADMINISTRATION
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PRESENTATION OUTLINE

- WATER ORGANIZATION in TURKEY
- GENERAL INFORMATION ABOUT İSKİ
- HISTORY OF WATER IN İSTANBUL
- WATER SUPPLY
- PREPAREDNESS TO PHYSICAL AND CYBER SAFETY

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İSTANBUL WATER AND SEWERAGE ADMINISTRATION
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Duties and authorities of General Directorate of Water Management;

Ensuring the supply of adequate quantity and appropriate quality of drinking water for every stage from basin to final consumer and the criteria, procedures and principles to be followed.

Determination of Special Provisions in Drinking Water Supply and Basin

Standards for raw water quality for treatment plants is determined and classified for each water quality class, treatment methods and treatment facilities design norms and standards

Drinking water for efficient use and efficiency for the control of water losses in water distribution networks and principles

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DSİ, MoEU and Metropolitan Municipalities Water and Sewerage Administrations by; drinking water Master Plan preparation works are carried out.

Water use in DSI's plans, current and future water needs and resources adequacy, for alternative sources technical, economic and environmental feasibility for planning

Ensure the safety of drinking water as focusing on point received

Drinking water for the supply of drinking water studies to determine whether the standards factors affecting water quality in the system limited to the major problems encountered.

Preparing regulation on the above titles for securing adequate water supplying

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İSTANBUL WATER AND SEWERAGE ADMINISTRATION
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- ✓ Strategy Plans
- ✓ Basin Protection Action Plans
- ✓ Water Quality Action Plans
- ✓ Sensitive Area Project Basin Action Plans
- ✓ Basin Protection Action Plans Measure Strategy Booklets
- ✓ Sectoral Water Allocation Plans
- ✓ National Drought Management Strategy Paper and Action Plan
- ✓ Drinking Water Protection Plans
- ✓ Strategy and Roadmap Action Plan on Modeling
- ✓ National Basin Management Strategy

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İSTANBUL SU VE KANALİZASYON İDARESİ

GENERAL INFORMATION ABOUT İSKİ
İstanbul Metropolitan Municipality
Istanbul Water and Sewerage Administration (İSKİ)

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İSTANBUL SU VE KANALİZASYON İDARESİ

Foundation of İSKİ

- > The first water administration in İstanbul was established in 1869. Water and sewerage services in İstanbul were combined under İSKİ (Istanbul Water and Sewerage Administration) in 1981.
- > İSKİ is a subsidiary of İstanbul Metropolitan Municipality, and has its own budget. Almost the whole budget income is received from water sales. Its service area covers the whole territory within İstanbul's borders.



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İSTANBUL SU VE KANALİZASYON İDARESİ

Duties of İSKİ

- > To provide water
- > To collect, treat and discharge wastewater
- > To protect water resources

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İSTANBUL SU VE KANALİZASYON İDARESİ

Key Figures on Istanbul

- > Population served : 15.029 million
- > Total Service Area of İSKİ : 9.271 km²
- > Total number of customers : 6.3 million
- > Total length of water networks : 18.822 km
- > Total length of the Transmission Line : 2.527 km
- > Total length of sewers : 15.730 km
- > Total length of the Collectors : 1.113 km
- > Total Length of Tunnels : 201 km
- > Total length of rainwater networks : 3.999 km
- > Annual yield of water resources : 1 billion 653 million m³/year
- > Average daily water supply : 2.8 million m³/day
- > Volume of Water Storage Tanks : 1.632.580 m³
- > Budget (2018) : 7.436.446.000 TL / 1,536,455,785 \$
- > Investment (2018) : 3.210.999.000 TL / 663,429,545 \$

Total length of water lines: 21.349 km
Total length of waste water lines: 21.043 km

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İSTANBUL SU VE KANALİZASYON İDARESİ

Hierarchical Structure at an Operational Level

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    graph TD
      A[General Assembly  
(Istanbul Metropolitan Municipality Council)] --> B[Board of Management]
      B --> C[Director General]
      C --> D[Deputy Directors General]
      D --> E[Heads of Departments]
      E --> F[Directors]
      F --> G[Chiefs]
      G --> H[Officers-Workers]
    
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İSTANBUL SU VE KANALİZASYON İDARESİ

İSKİ Staff

Officer : 2.563

Worker : 3.773

Total : 6.336

Total number of staff including personnel of subcontractors : 12.147



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History of Water in Istanbul



➤ Istanbul is one of the world's most ancient cities. Founded on the Bosphorus linking Asia to Europe, it is also Turkey's largest city in terms of history, trade and culture and for centuries served as the capital of the Byzantine and Ottoman Empires.

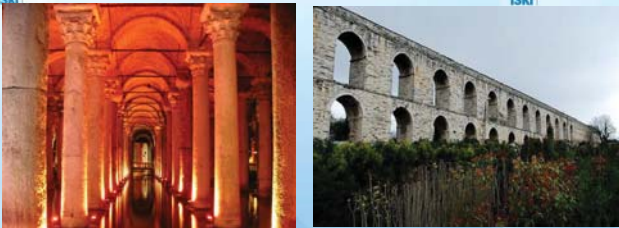
History of Water in Istanbul



➤ Throughout history Istanbul has been a magnet, a city of strategic importance where a water problem has always existed.

➤ The transmission lines, cisterns, reservoirs, aqueducts, historic dams and fountains built at various times to ensure a water supply for the city formed an impressive water civilization.

The Roman Period



➤ During the Roman period, water demand of İstanbul was supplied from wells, small springs and cisterns.

➤ In order to meet increasing water demands of the city, Emperor Valens brought water from Halkalı to Beyazıt through transmission lines.

The Byzantine Period



Aspor (Çukurbostan) Cistern

➤ Armies besieging İstanbul to conquer the city used to block water coming to and flowing outside the city walls to break Byzantine resistance and to destroy water ways.

➤ In order to store water as a precaution as a result of these sieges, over 70 covered and open cisterns were constructed during the Byzantine period.

The Ottoman Period

➤ Upon the conquest of İstanbul by Fatih the Conqueror, he commanded the restoration and expansion of old water ways which were out of use due to neglect, earthquakes and destruction of the invaders and new water ways were constructed.

Water Ways Constructed and Developed during the Ottoman Period

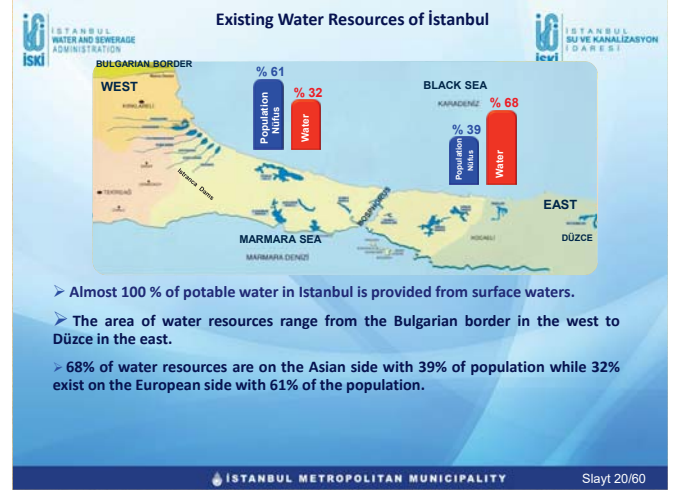
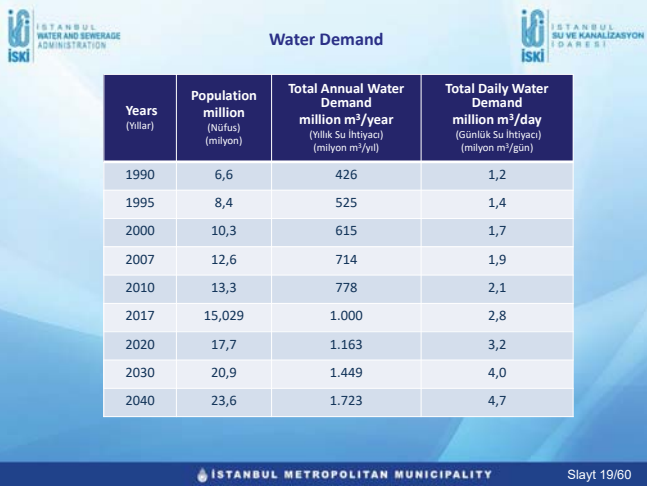


- Halkalı Water Ways
- Kırkçeşme Water Ways
- Üsküdar Water Ways
- Taksim Water Ways
- Hamidiye Water Ways



Potable Water Supply

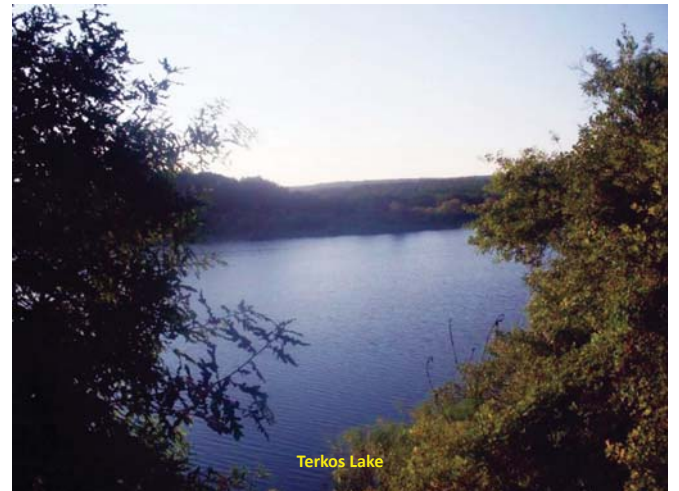
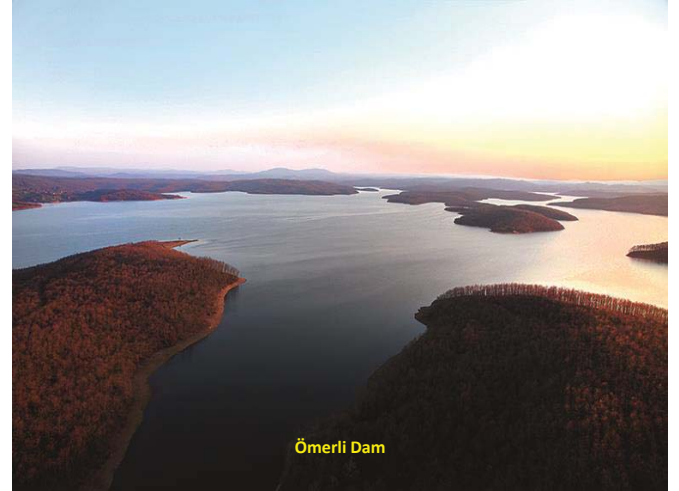




Existing Water Resources

Name of the Plant (Tesisin Adı)	Put into Operation (Hizmete Giriş Yılı)	Yield / Verim (million m ³ /year)
Aqueducts	1620-1839	2,5
Elmalı I & II Dams	1893 – 1950	15
Terkos Dam	1883	142
Alibeyköy Dam	1972	36
Ömerli Dam	1972	220
Darlık Dam	1989	97
Büyüçekmece Dam	1989	100
Yeşilvadi Weir	1992	5
Istrançalar (Düzdere, Kuzuludere, Büyükdere, Sultanbahçedere, Elmalıdere)	1995-1997	75,2
Wells	1996-2007	25,7
Kazandere Dam	1997	100
Sazlıdere Dam	1998	55
Pabuçdere Dam	2000	60
Yeşilçay Weir	2004	145
Melen I	2007	268
Melen II	2014	307
Total		1,653.4

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Drinking Water Treatment Plants

Name of the Plant Tesisin Adı	Year Commissioned Hizmete Giriş Yılı	Explanation Açıklama	Capacity (m ³ /day) Kapasite (m ³ /gün)	
Ömerli	1972	Existing (Mevcut)	300,000	
	1995	Capacity Increased (Kapasite Artırımı)	200,000	
	1995	New (Yeni Tesis)	320,000	
	1997	Renewing (Yenileme)	220,000	
	2001	New (Yeni Tesis)	500,000	
Ömerli Total			1,540,000	
Kağıthane	1972	Existing (Mevcut)	378,000	
	1996	Renewing (Yenileme)	280,000	
	1996	Capacity Increased (Kapasite Artırımı)	70,000	
Kağıthane Total			728,000	
B.Çekirgeçe	1989	Existing (Mevcut)	420,000	
Etilah	1994	Renewing (Yenileme)	50,000	
Fatih Sultan Mehmet	1998	New (Yeni Tesis)	420,000	
İkitelli	II.Beyazıt	2003	New (Yeni Tesis)	420,000
İkitelli Total			840,000	
Yapılı Potable Water Treatment Plant	2006	New (Yeni Tesis)	50,000	
Cumhuriyet Potable Water Treatment Plant	2012	New (Yeni Tesis)	720,000	
Other (Ağva, Bıçkudere, Danamandra, Hacosman, Yalılık, Şile Esenceli, Şile)			67,860	
TOTAL			4,395,860	

➤ İSKİ provides service by 19 potable water treatment plants

Locations of Potable Water Treatment Plants



Potable Water Supplied to City in Years (million m³)



➤ 1 billion 21 million m³ potable water is supplied to Istanbul city in 2017



Ömerli Potable Water Treatment Plant



Büyükçekmece Potable Water Treatment Plant



Cumhuriyet Potable Water Treatment Plant



İkitelli Potable Water Treatment Plant

Existing Transmission Lines

In order to provide regular and abundant water

Melen-Kağıthane
 Terkos – Kağıthane, Terkos – İkitelli,
 Ömerli – Çamlıca, Çamlıca – Salacak,
 Pendik – Küçükyalı, Maltepe – Adalar,
 Çatalca – Mimarısınan, Alibeyköy – Kağıthane
 etc. transmission lines of Ø3000 mm were constructed

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Transmission Lines

The length of the main transmission lines whose diameter extend from 400 mm to 4000 mm is 2.527 km

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İski SCADA System

- Thanks to the modern SCADA (Supervisory Control and Data Acquisition) System with latest technologies;
- Rise level in dams during rainfall can be measured,
- Failures in the system can be tracked and addressed with immediate response,
- Water level, pressure and flow in dams, treatment plants, main transmission lines, pumping stations and storage tanks can be instantly monitored, evaluated and addressed.
- Information such as meteorological data and water quality can be instantly monitored.

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Water Quality

100-150 samples of water from various parts of Istanbul are taken every day and chemical and bacteriological tests are made.

By making water treatment plants and renewing distribution network drinking water has come up to a standard above World Health Organization (WHO), European Union (EU), USA Environmental Protection Agency (EPA) and Turkish Standards Institution (TSE).

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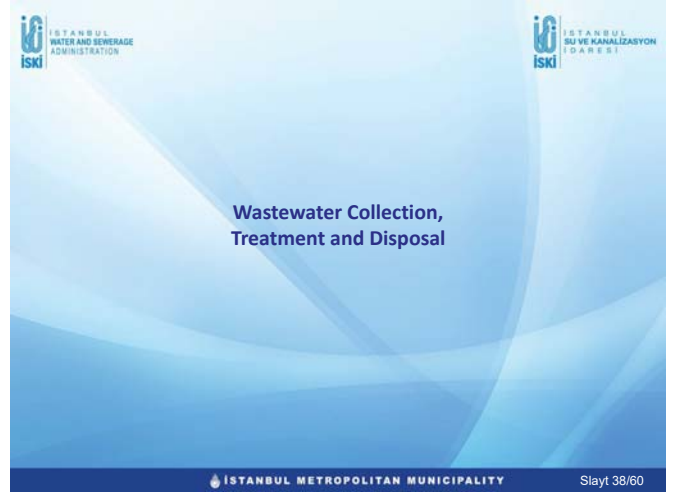
The Istanbul Water Quality Report

PARAMETERS	STANDARDS				İSKİ POTABLE WATER TREATMENT PLANTS					
	TSE 266 2005	World Health Organization (WHO) 2011	USA Envir. Prot. Agency (EPA)2008	European Council (EC) 1998	B.Çekirgece	İkitelli	Kağıthane	Ömerli	Çamburlut	
Primary Standards (Clarity), ntu										
Turbidity	1	5	1	1	0,14	0,18	0,16	0,21	0,17	
Primary Standards (Microbiological), kob/100 ml										
Coliform Bacteria	0	0	0	0	0	0	0	0	0	
Primary Standards (Disinfection By-Products), µG/l										
Total Trihalomethanes	100	400	80	100	47,3	25,5	19,1	17,5	33,6	
Bromate	3	10	10	10	<2,0	<2,0	<2,0	<2,0	<2,0	
Primary Standards (Inorganic Chemicals), Mg/l										
Aluminium	0,200	0,100	0,200	---	0,110	0,059	0,081	0,031	0,013	
Arsenic	0,01	0,01	0,01	---	0,0007	<0,0005	<0,0005	<0,0005	<0,0005	
Barium	---	0,7	2,0	---	0,002	0,029	0,027	0,029	0,020	
Cadmium	0,005	0,003	0,005	0,005	<0,0002	<0,0002	<0,0002	<0,0005	<0,0002	
Chromium (Total)	0,05	0,05	0,10	0,05	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	
Fluoride	1,5	1,5	2,0	1,5	0,25	0,07	0,07	0,06	0,06	
Bromide	---	---	---	---	0,05	0,02	0,03	0,01	<0,01	
Cyanide	0,05	0,07	0,20	0,05	<0,02	<0,02	<0,02	<0,02	<0,02	
Lead	0,010	0,010	0,015	0,010	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	
Mercury	0,001	0,001	0,002	0,001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	
Nitrat (NO ₃)	50	50	45	50	0,6	0,8	0,7	1,8	3,4	
Selenium	0,01	0,01	0,05	0,01	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005	
Silver	---	0,10	0,10	---	<0,0150	<0,0005	<0,0005	<0,0005	<0,0005	
Antimony	0,005	0,020	0,006	0,005	<0,0002	<0,0002	<0,0002	<0,0002	<0,0002	
Beryllium	---	---	0,004	---	<0,0002	<0,0002	<0,0002	<0,0002	<0,0002	

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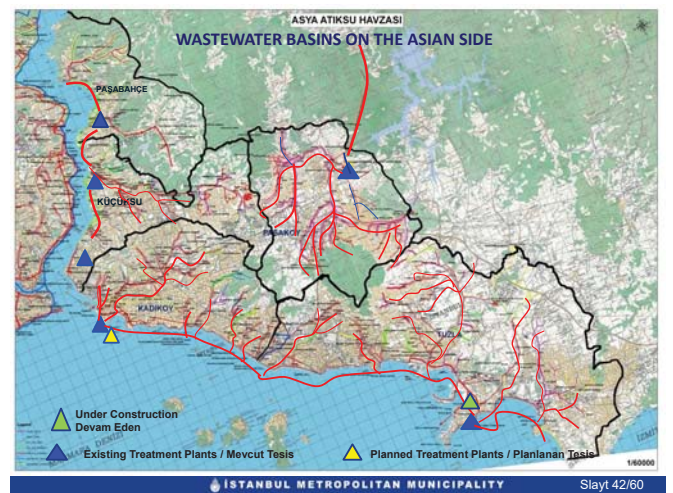
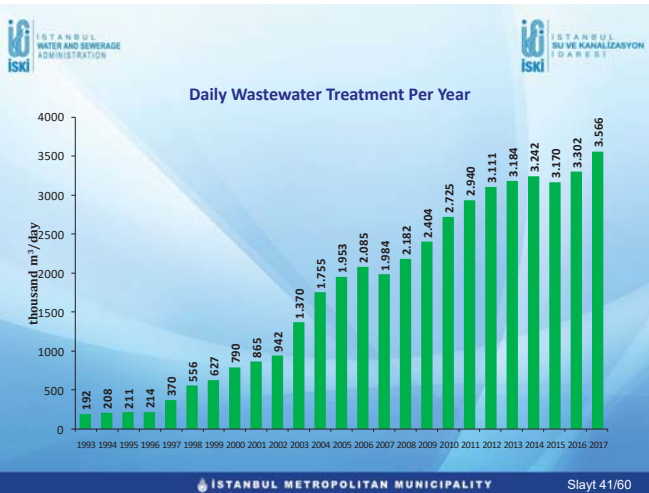
The Istanbul Water Quality Report

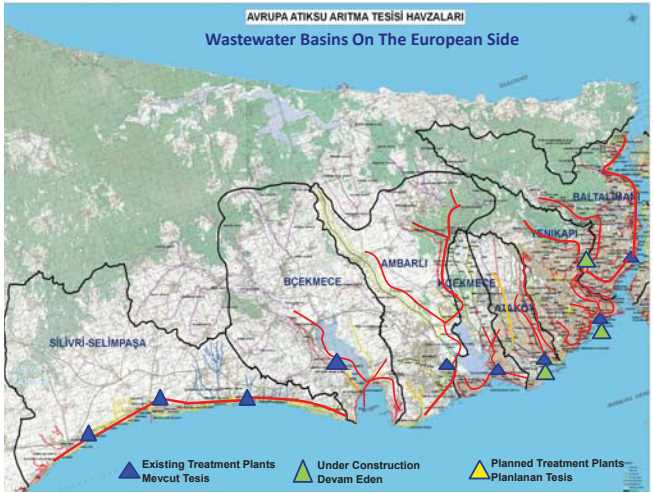
Secondary Standards (Aesthetic), mg/L									
Chlorine	250	250	250	250	93	43	41	30	56
Colour (unit)	20	15	15	---	<2,0	<2,0	<2,0	<2,0	<2,0
Copper	2	2	1	2	<0,001	<0,001	<0,004	0,002	<0,001
Iron	0,2	0,3	0,3	0,2	0,010	<0,005	<0,005	0,078	0,009
Manganese	0,05	0,1	0,05	0,05	0,002	<0,002	<0,002	0,009	<0,002
pH	6,5-9,5	6,5-8,0	6,5-8,5	6,5-9,5	7,21	7,24	7,05	7,09	6,89
Sulphate	250	500	250	250	96,7	39,6	66,9	28,9	19,3
Total dissolved materials	---	1000	500	---	357	204	258	314	279
Zinc	---	3,0	5,0	---	<0,01	<0,01	<0,01	0,051	0,045
Additional Parameters , mg/L									
Calcium	---	300	---	---	56,6	47,1	47,9	38,0	42,9
Hardness (as CaCO ₃)	---	500	---	---	196	135	193	195	132
Magnesium	---	---	---	---	14,2	4,8	6,9	7,0	8,2
Potassium	---	---	---	---	5,3	2,6	2,6	2,5	3,1
Sodium	300	200	---	200	55,2	18,2	23,4	15,3	15,1
Free Chlorine (measured at plant outlet)	---	5,0	4,0	---	1,55	1,00	1,2	1,56	1,56
Ammonium	0,5	1,5	---	0,5	< 0,03	<0,03	< 0,03	< 0,03	< 0,03



Wastewater Treatment Plants (General Information)

Wastewater Treatment Capacity	Daily Capacity (m ³ /day)	Daily Average Water Treated in 2017 (m ³ /day)	Total Amount Treated in 2017 (m ³ /year)
TOTAL for European Side	3,119,555	2,194,011	800,814,336
TOTAL for Asian Side	2,633,660	1,372,213	500,857,255
TOTAL for ISTANBUL	5,753,465	3,566,224	1,301,671,591





SURFACE WATER QUALITY MONITORING

- ✓ To protect drinking water resources quality of the surface water of Istanbul is monitored by collecting monthly samples from about 90 river, stream and lake stations.
- ✓ Routinely about 40 parameters which are listed in the table are measured and assessed in the central laboratory of İSKİ.

PARAMETERS	METHOD
Chemical Oxygen Demand (COD)	SM 5220 B
Biochemical Oxygen Demand (BOD)	SM 5210 B - SM 5210 D
Chloride (Cl ⁻)	SM 4500-Cl B
Dissolved Oxygen (DO)	SM 4500-O - B - SM 4500-O - G
% Dissolved Oxygen (% DO)	SM 4500-O - G
Salinity	SM 2520 B
Conductivity	SM 2510 B
pH	SM 4500-H ⁺ B
Temperature	YSI Multi-Parameter
Total Suspended Solids (TSS)	SM 2540 D
Sulfate (SO ₄ ²⁻)	SM 4500-SO ₄ ²⁻ D
Ammonium Nitrogen (NH ₄ ⁺ -N)	EN ISO 11732
Nitrate Nitrogen (NO ₃ ⁻ -N)	SM 4500-NO ₃ -I
Total Phosphorus	SM 4500-P-I
Color	SM 2120 C
Total Organic Carbon (TOC)	SM 5310 B
Total Kjeldahl Nitrogen (TKN)	SM 4500 N.org B
Anionic Surfactants as MBAS (Methylene blue active substances)	ISO 16265-2, EN903
Phenols	SM 4120 B - SM 5530 D
Total Cyanide	TS EN ISO 14403-2
Total Sulfur	SM 4500 S 2- E
Total Chromium (Cr), Copper (Cu), Zinc(Zn), Ferum(Fe), Manganese(Mn), Barium(Ba), Aluminum(Al), Boron(B), Cobalt(Co)	SM 3120 B
Total coliform	ISO 9308-2
E.coli	ISO 9308-2

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ONLINE MONITORING OF RIVER WATER QUALITY

- ✓ Furthermore, real-time measurement of water quality in three streams of Ömerli and Elmali drinking water basins is also conducted to detect source water contamination incidents.
- ✓ The measured parameters are flow, pH, temperature, conductivity, dissolved oxygen, ammonium, total nitrogen, total suspended solids, total organic carbon and total phosphorus.

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