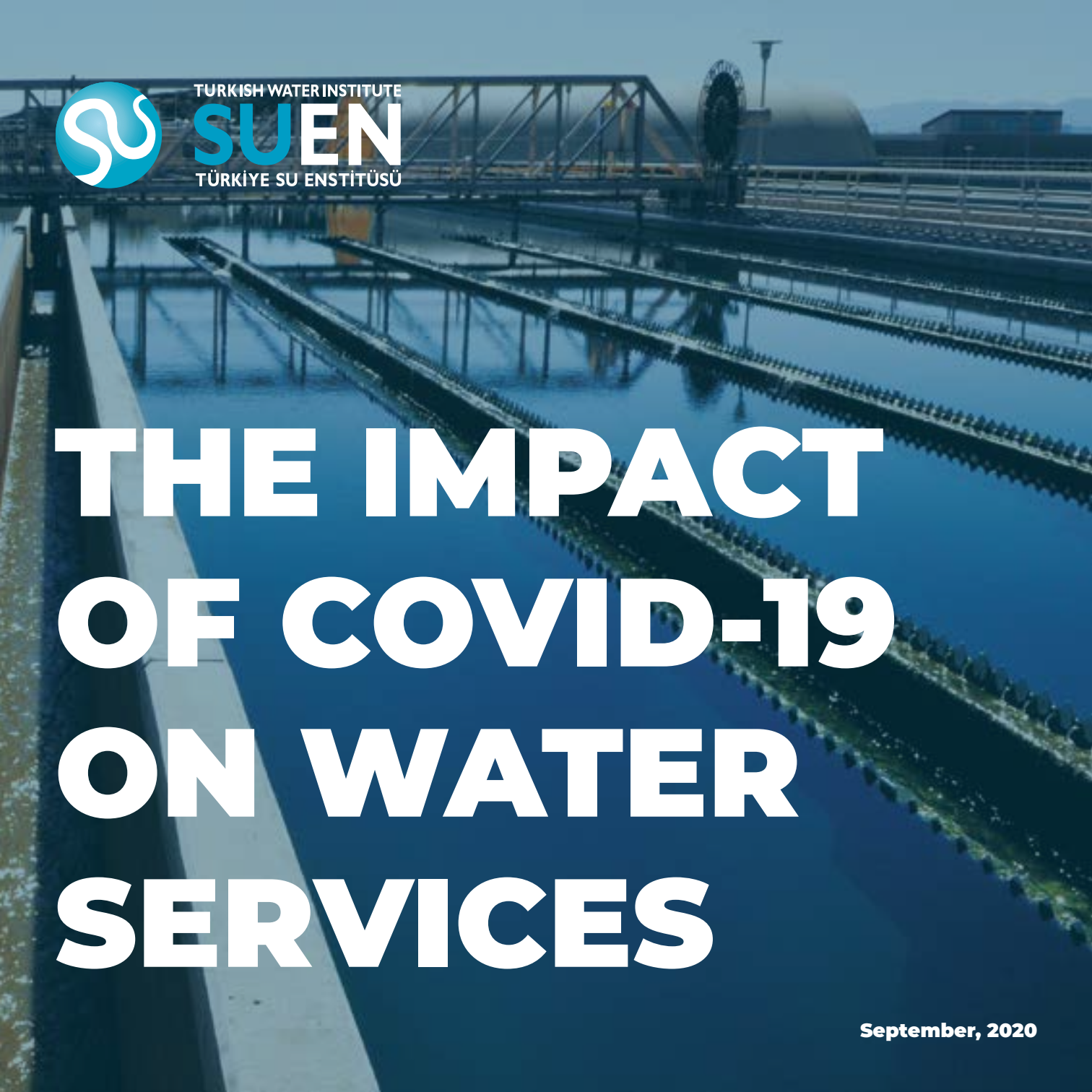

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THE IMPACT OF COVID-19 ON WATER SERVICES

September, 2020

Acknowledgment

We first and foremost thank the water and sewerage administrations' hard working personnel making sure that clean water has been uninterruptedly supplied during the COVID-19 pandemic.

As this study was based on the questionnaires answered by the administrations, we also thank those from the cities of Adana, Ankara, Antalya, Bursa, Eskişehir, Gaziantep, Hatay, İstanbul, İzmir, Kayseri, Kocaeli, Sakarya and Samsun who shared their challenges, experiences and measures.

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The Study on the Impact of COVID-19 on Water Services

As of December 2019, the highly infectious COVID-19 disease (caused by the SARS-CoV-2 virus), that emerged in Wuhan, China, spread all over the world leading the World Health Organization to declare in a short time the outbreak as a global pandemic on March 11th, 2020. One of the most important individual measures to be taken against the disease is ensuring self hygiene by washing hands frequently with soap and water for at least 20-30 seconds.

United Nations remarked that 2.2 billion people around the world don't have access to clean drinking water and 4.2 billion people lack safely managed sanitation. In addition, 3 billion people
lack basic handwashing facilities at home, which is the most effective method in the combat against COVID-19.

The global crisis on global level has once again clearly shown the indispensable importance of access to water and sanitation (WASH) services. It is essential for all countries to work together and mobilize political will in order to achieve the goal of "SDG 6: Ensure availability and sustainable management of water and sanitation for all", an integral part of the Sustainable Development Goals (SDGs). The pandemic yet can be turned into an opportunity to meet the ambitious goals to ensure all people have access to water and sanitation services.

In Turkey, water and sanitation services are delivered to the most remote settlements. The rate of municipal population served by drinking water network to the total municipal population is 99%, while this is 91% for sewerage systems (Turkish Statistical Institute, Municipal Water Statistics for the year 2018).

The COVID-19 outbreak has laid a large responsibility on water and sewerage administrations to secure the continuity of water supply. In this study, based on the feedback from Metropolitan Water and Sewerage Administrations, challenges faced and measures taken in the pandemic are presented and evaluated.

Change in Water Demand

As part of the national COVID-19 measures, such as lockdown and flexible working, which were put into effect more frequently in the period of 23 March and 1 June 2020, a rise in demand for domestic water was experienced as a result of more time spent at home. This increase was reported to vary between 5% and 30%. Yet, it is known that there is a tendency to temporarily relocate to rural areas due to the outbreak. Particularly in the provinces where summer houses are in majority, an uptake in water demand of up to 30% were observed.

As domestic water consumption went up, water use went down in businesses such as tourism, barbershops, restaurants, as they were out of operation resulting from the pandemic measures. Non-industrial commercial water use, for instance, fell by 14.2% in Istanbul, the most populous city in the country.

Industrial consumption dropped throughout the country. For example, it was stated that industrial water use declined by 39.9% in the capital city Ankara while in Kocaeli, a highly industrialized city, this rate was reported as 9%.

In spite of the change in sectoral (domestic and industrial) water uses in the municipalties contributing to the survey, there was no need for inter-sectoral water transfers. In other words, there was no need to provide less water to industry and other uses to meet the growing domestic water demand.

The seasonal fall in drinking water resources and unforeseen excessive water consumption due to the pandemic also affected water treatment facilities and water distribution systems. For this reason, low water pressure or local water shortages were experienced in some locations.

Financial Impacts and Measures

As the outbreak severely impacted the global economy, various regulations and measures have been put in place by both the central government and local authorities to secure uninterrupted access to water services, in particular by the citizens experiencing financial difficulties. The most prominent of these were the suspension of water bills and cancelling water cuts-offs resulting from nonpayment.

There are also settlements in Turkey where water services are provided via prepaid card meters. All obstacles, if any, of prepaid customers were removed, and they were supplied with water by pre-given advance credits. It was safeguarded that all citizens were provided with water services by re-filling the prepaid cards of vulnerable groups (with chronic illnesses and over 65 years of age) at their residences.

Ensuring the sustainability of these services is as vital as providing uninterrupted water services in these periods. As such, the municipalities took measures to enable that the invoices were paid in installments and collected within a certain period of time. The "default interest/penalty" normally accrued for bills not paid on time were annulled.

Some municipalities initiated social solidarity campaigns such as the "payit-forward (bill on the hook)" practice that allows people to voluntarily pay an outstanding bill of an anonymous person who is not able to pay. On the other hand, some other municipalities provided direct support by paying the bills of low-income customers through social funds.

Some administrations lowered water tariffs while some raised them. Another practice reported was the removal of increasing block water tariffs applied to domestic customers.

The pandemic caused a drop in the revenues generated from water services, and due to the growing demand for water, the expenses borne for the treatment of water and its distribution to the taps went up. Some municipalities also reported an increase in the prices of electricity and chemicals used in water treatment facilities. The rise in exchange rates drove the prices of chemicals and equipment up procured from abroad.

As a result of the decline in revenues, compulsory payments (electricity, personnel, loan repayments, etc.) were prioritized, while some maintenance, repair and investment activities had to be postponed.

Impacts on Human Resources and Measures

As part of national measures declared following the pandemic, staff with chronic illnesses either worked from home or were considered on administrative leave, according to their job description. In addition, the number of active workforce diminished as some employees contracted the disease. Furthermore, shifts were re-organized, reserve staff were re-assigned and staff rotations were implemented to ensure the staff working in the operation of critical facilities to be minimally affected.

Upon the declaration of the pandemic, water meter readings in the field were halted in order to reduce possible contraction of the disease, and instead, invoices were generated based on the average historical consumption.

In order to protect all human resources,measures were taken such as supply of sufficient masks, placement of hand disinfectants in common areas, regular fever measurements, lunch box system in the cafeteria and flexible/alternate working. Periodic disinfection of common areas, shuttle vehicles and heavy equipment are other measures stated. There are also administrations where COVID-19 contact tracing was stated to be conducted.

The International Impacts of COVID-19 on Water and Sanitation Services

Not only of Turkey, but all countries' water and sanitation sectors have substantially been impacted by the outbreak. A report, titled as "The Impact of COVID-19 on the Water and Sanitation Sector" and published by World Bank, listed the primary impacts as hereunder.

• **The world's poorest received the COVID-19 shock on top of existing major urban water and sanitation services deficits, all pointing towards a potentially overwhelming burden to contain the virus.** A recent World Bank tool for identifying pandemic "hotspots" pointed to the cramped living conditions of cities and inadequate public services especially inadequate waste management and sanitation, as significant sources of risk for contagions in large developing market cities, such as Cairo and Mumbai.

• **Global Water Leaders Group estimates that industrial water demand will fall by an average of 27 percent due to COVID-19.** Many large users of water have downscaled or reduced activities resulting in declining industrial demand.

• **Investments will drop with the diminishing revenues.** New capital projects are likely to be delayed as municipalities prioritize Opex and emergency response. Global Water Intelligence (GWI) estimates capital expenditures in the water sector will decline during the 2020–21 period, after which it may resume at pre-crisis forecast levels. A downward adjustment of 7 percent in the global water sector Capex projections for 2020 is expected.

• **Many countries implemented measures leading to revenue losses in water and sanitation services.** For example, a water utility in Chile agreed with the government on deferring water and sanitation bills for almost half of its poorest clients who consume up to 10 cubic meters per month for the duration of the "Declaration of Catastrophe." Amounts accumulated during this time will be repaid in equal installments without penalties or interest during the subsequent 12 months. In Brazil, a water utility announced three months of tariff exemptions for low-income households, a 3-month postponement of tariff adjustments, and the donation of water tanks to one of the biggest informal settlements in its service area.

Given the critical role of water sector to contain pandemic diseases, World Bank highlights the importance of implementation of automation (incl. customer services) and remote-control processes as they become ever more crucial at times like these. Taking the COVID-19 effect into account, GWI estimates global spending on digital solutions to grow 8 percent annually, on average, from $32 billion in 2019 to $47 billion by 2024.

In a webinar organized by UNESCO on "COVID-19 Implications on Water Management in Megacities", country experiences and challenges were shared in addition to those cited in the World Bank report.

> *• Cairo mentioned another challenge faced during the pandemic: availability of critical materials as chemicals, fuel, spare parts and PPEs;*
>
> *• In Guangzhou, although water service is relatively well accessible by households, the migrant workers became one of the most vulnerable group. They were neither always accommodate with an unstable living condition, nor able to go back to their hometowns because of the restriction policy of domestic travel;*
>
> *• Lima highlighted the specific issue of migration. Due to the lock-down, large amount of urban population went back to their hometowns in rural areas. It generated an augmentation of water demand, which the operators in those areas were not ready to meet.*

Impacts on Drinking Water Treatment and Measures

The treatment of drinking water is one of the most critical phases in the supply of water. During the pandemic, some modifications were needed in treatment processes, taking the source and quality of raw water as well as length and performance of the water distribution network into consideration. There were also challenges encountered in connection with the drop in revenues and number of available staff.

Some of the treatment plants experienced difficulties in the procurement of electricity and chemicals vital for operation. It was also pointed out that challenges were faced in the procurement of imported chemicals (e.g. active carbon) and spare parts/equipment, utilized in maintenance and repair activities, as a result of longer waiting times in the customs and fluctuations in the exchange rate.

The main modification in treatment processes was the scale up of coagulation chemicals and particularly residual chlorine concentration in the network.

The frequency of controls, carried out to monitor water quality, at the outlets of the treatment plants and various points of the network were raised.

There are some settlements where water is supplied not from a central water treatment plant but from local water sources such as wells. In that case, the amount of chlorine was upped in the network supplied by local water sources and controls were tightened.

Apart from all these measures, some utilities could continue to provide drinking water at the standards specified in the By-law on Drinking Water Intended for Human Consumption published by the Ministry of Health without any changes in the treatment processes.

Viruses in Drinking Water and Disinfection of Drinking Water

Wastewater may infiltrate into water transmission lines and city networks if the lines are not kept under pressure. As a result of wastewater infiltration, viruses (such as adenovirus, Hepatitis A and E, rotavirus), bacteria (such as cholera), parasites (such as giardia, cryptosporidium) may be the cause of water borne diseases.

In drinking water treatment, the turbidity and the suspended solids in water are removed by adding chemicals such as aluminium sulphate, iron chloride, polymers. Following coagulation, flocculation, sedimentation and filtration processes, the water is disinfected. A portion of the viruses, bacteria and parasites are removed as the water goes through these processes. For example, deep bed sand filtration can remove 2 log virus (1 virus leaves when 100 viruses enter). In the latest disinfection stage, log 4 virus removal is aimed (when 10 000 virus enter, only one leaves out). For 4 log kill, the concentration of chlorine in water and the residence time are important.

If the chlorine concentration is low, the residence time should be extended to achieve the same result. Other disinfection agents such as UV radiation and ozone can be used but these agents do not have residuals as chlorine. The residual chlorine lasts longer in the transmission lines and disinfects if there is a leak into the drinking water lines. The aforementioned viruses, which are much harder to inactivate, are removed in water treatment plants for many years.

Hepatitis A and Adenoviruses are much more difficult to kill than the SARSCoV-2 virus. As these viruses are effectively inactivated by the treatment processes and disinfection systems used in water treatment, the possibility of water as a transmission source for SARS-CoV-2 is minimal.

There is no reported case of SARSCoV-2 transmission through drinking water given that the main transmission way of the virus is through the respiratory system. US Environmental Protection Agency (EPA) has reported that the SARS-CoV-2 virus has not been detected in drinking waters and stated that the citizens can drink the tap water.

Maintenance, Repair and Investment Works in the Pandemic

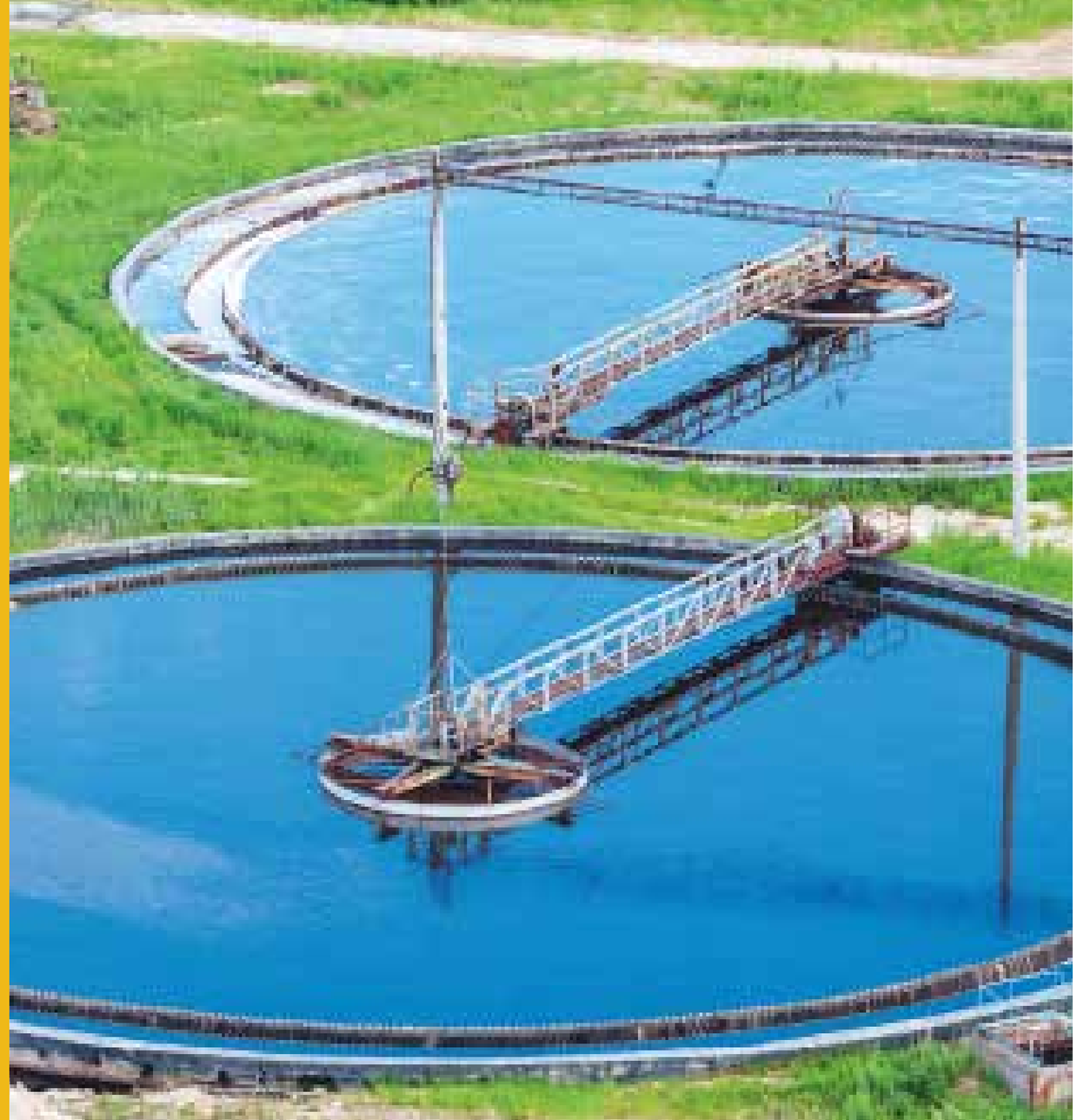
The works related to O&M and investments have heavily been impacted by the pandemic. As these works require high budgets and workforce, plans were accordingly revised to avoid service interruptions. In times of outbreaks evolving in an unexpected and rapid manner, crisis management, dynamic decision making and resilience become a must-haves to adapt to the situation.

Many water and wastewater administrations took advantage of the minimal traffic due to the lock-down to rehabilitate and renew old lines in the drinking water and sewer networks.

There were some administrations fully or partially halting or postponing the investment projects, leading some tenders to be cancelled.

As the staff worked on a rotation basis, addressing urgent failures in the system was prioritized to prevent water service interruptions.

The outbreak emerged unexpectedly, thus it was inevitable to update the existing Risk Assessment Reports, Emergency Action Plans and Plant Operation Plans.



Measures to be taken at Wastewater Treatment Plants during the Pandemic

Although transmission of COVID-19 through wastewaters is not considered one of the main causes of infection, it is yet wise to be diligent in wastewater treatment plants. In the national surveillance studies carried out under the coordination of Turkish Water Institute (SUEN), RNA of the virus is detected in both samples taken from inlets and outlets of the plants. Detecting RNA of the virus, however, does not indicate itself that the virus is active (alive) or inactive (non-living).

In wastewater treatment plants, especially in the ones having surface aerators, the possibility of inhaling virus from aerosols caused by surface aerators should not be neglected. It is advised that staff working close to such aeration units should wear double masks, goggles and, if possible, transparent face masks.

In the surveillance study conducted throughout Turkey, it was established that the virus concentration is higher in the activated sludge. As such, it is necessary to be careful, in particular for water splashes and aerosols in the processing of the sludge.

If treated wastewaters are used in irrigation, these must be disinfected. Chlorine disinfection is known to be the most cost-effective method. In addition, 254 nm UV disinfection, chlorine dioxide and ozone can be used as alternatives. Chlorination is recommended as a backup to UV disinfection systems.

COVID-19 and Wastewater Reuse

It is known that the SARS-CoV-2 virus is mainly transmitted person-to-person via droplets and direct contact. There is no evidence of infection by way of water. In the surveillance studies conducted worldwide as well as in Turkey, the virus has been detected in wastewater. The virus was found to be inactive except one sample in the national surveillance study. Yet, to minimize any risks, it is wise to strengthen protective measures for those who have the risk of contact with wastewater. As treatment sludge is used to nurture the soil, it is advisable to suspend this practice for risk minimization.

Given that SARS-CoV-2 is a singlestranded RNA virus covered with a lipid cell membrane, the virus is highly susceptible to soap, detergents and disinfectants. Recent studies show that the virus is much more sensitive than the microorganisms, frequently found in wastewater (such as Escherichia coli), in that it can be completely inactivated through disinfection.

Treated wastewater is used primarily in the irrigation of green areas as well as for back wash water in various units within the treatment plant. It may also be used as generalpurpose and/or cooling water in the industry.

The Ministry of Environment and Urbanization issued a Circular titled as "COVID-19 Pandemic and Measures on Wastewater Management" on April 8th, 2020 to regulate the reuse of treated wastewater during the pandemic. The Circular stipulates that wastewater used for irrigation purposes (both crops and green areas) must be disinfected. In addition, the activities of rafting, swimming, grain washing etc. are not to be permitted if they are located at the downstream point of a treated wastewater discharge. In the case of permission of these activities, disinfection should be applied at the end of treatment plant.

Furthermore, a guide book titled as "Assessment of COVID-19 Virus Transmission Risk from the Perspective of Wastewater Reuse" was published by the Ministry of Agriculture and Forestry that served an instrumental source in the period.

At the time of pandemic, some municipalities suspended the reuse of wastewater, while some others established chlorination units pursuant to the Circular issued by the Ministry of Environment and Urbanization.

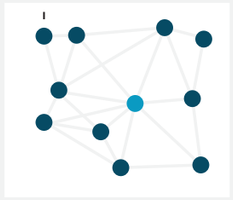
Monitoring of SARS-CoV-2 in Wastewaters

Some countries are conducting scientific research to monitor the presence of the novel coronavirus (SARS-CoV-2) in wastewaters in their combat against the COVID-19 outbreak. The main purpose of these studies is to see the distribution and trends of the virus and thus have a tool to be able take early measures.

Under the coordination of SUEN and with support of State Hydraulic Works, General Directorate of Food and Control, General Directorate of Water Management all under the Ministry of Agriculture and Forestry as well as Marmara University Environmental Engineering Department, a study is implemented to monitor the virus in the wastewaters of Turkey. The study covered all 81 provinces in the country so that the quantitative distribution of the outbreak is followed on national level.

With the analyses made, the trends of cases in the region to where wastewater treatment plants serve are observed, the possibility of a second wave are evaluated and virus detection is enabled for the reuse of treated wastewaters in agriculture.

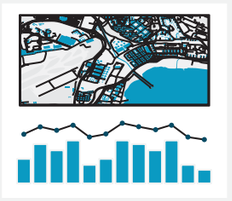
With this study, Turkey took part among the first countries to carry out SARS-CoV-2 detection works in wastewaters.



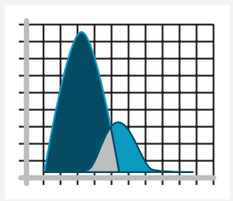
Epidemiological Model

COVID-19 Surveillance

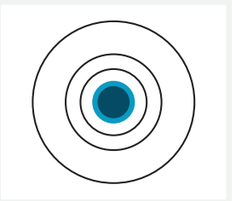
Risk Assessment



Spatial and Temporal Analysis



Current and Potential Status of Pandemic



Hot Spots

Overall Assessment

COVID-19 has once again reminded us the indispensable role of nonintermittentprovision of water and sanitation services to prevent and combatsuddenly emerging epidemics and pandemics. All relevant stakeholders in the water and sanitation sector have to adapt to this “new normal”.

The effective cooperation and coordination between central and local uthorities are crucial to ensure that water and sanitation services are sustained without any interruption and vulnerable groups are impacted at the minimum.

As available workforce and balance of incomes and expenses fluctuate dramatically in these times, innovative measures as well as rapid and dynamic decision-making in order to respond to the crises have become necessities. It is well known that each crisis offers an opportunity.

Digital solutions such as implementation of automation (including automated customer interfaces) and remote-control processes will rise dramatically in importance to secure crisis preparedness and resilience of the services. Sharing experiences and good practices and having these documented in detail for future generations are other critical aspects in the adaptation process.

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APPENDIX – QUESTIONS ANSWERED BY WATER AND SEWERAGE ADMINISTRATIONS

1. What are the effects of the COVID-19 pandemic on the amount of drinking and utility (domestic) water use within the service area of your municipality/administration?
(multiple options can be selected)

☐ Domestic water use increased / decreased (approximately ...%)
☐ Industrial water use increased / decreased (approximately ...%)
☐ Less water had to be supplied to industry and other uses to meet the growing demand of domestic water
☐ Interruptions in water delivery occurred
☐ It is known that there is a trend towards rural areas caused due to the COVID-19 pandemic. This situation led to an increase in water demand in the rural areas served by your municipality (approximately ...%)
☐ Other

Please specify:

.....

.....

2. What are the financial impacts of the COVID-19 pandemic on water services in your municipality/administration’s service area?
(multiple options can be selected)

☐ The revenue generated from water sales diminished (approximately ...%)
☐ Measures were planned to compensate the drop in revenue
(Measures taken: .....)
☐ There was a decrease in the treatment efficiency/the amount of treated water due to the decline in revenue
☐ There was a rise in the prices of electricity and chemicals consumed in treatment facilities.
☐ Water tariffs were raised/lowered (approximately ....%)
☐ Other

Please specify:

.....

.....

3. What are the measures taken by your municipality/administration to provide water service to all citizens in the best way during the COVID-19 pandemic?
(multiple options can be selected)

☐Payments of bills were deferred
☐ (Domestic) water tariff was reduced
☐ With the "pending invoice (pay-it-forward)" practice, the citizens financially burdened by the outbreak were supported
☐ The bills of the citizens falling under the low-income group were paid by the municipality
☐ If the water fee is collected via prepaid card system, how was (financial) support provided to the citizens with low income?
(.....)
☐ Other

Please specify:
.....
.....

4.What are the effects of the COVID-19 pandemic on human resources (staff) of your municipality/administration and thus on water services?
(multiple options can be selected)

☐ The number of staff available to work decreased
☐ Water services were negatively affected due to drop in the number of personnel
☐ The working schedules of the staff operating the facilities critical in water delivery were re-organized to avoid the risk of infection, and measures were taken to ensure that the operation of the facilities was not interrupted

Measures taken:
.....
.....
.....
.....

5. What are the effects of the COVID-19 pandemic on drinking water treatment and what are the measures taken?
(multiple options can be selected)

☐ During the period, difficulties were experienced in the procurement of electricity and chemicals required for the operation of treatment facilities
☐ Additional measures were taken for the treatment of municipal water to eliminate the risk of SARS CoV-2 virus transmission into water resources through infiltrating wastewater
☐ The amount of chlorine in the water supplied through the network was raised
☐ The dosage of treatment chemicals was raised
☐ Other

Please specify:
.....
.....

6. How were the planned investment and maintenance/repair activities affected during the COVID-19 process? What are the effects of this on possible water supply in the near future?
(multiple options can be selected)

☐ Investment projects were completely stopped
☐ Investment projects were partially stopped
☐ Maintenance and repair activities were postponed (due to financial reasons)
☐ Maintenance and repair activities were delayed (due to shortage in available staff)
☐ Taking opportunity of the lock-down, investment and maintenance/repair activities were accelerated
☐ Measures were prepared for the realization of incomplete investment and maintenance/repair activities
☐ Other

Please specify:
.....
.....
.....

7. Are there any areas in your municipality/administration where treated wastewater is reused? If so, what are those?
(multiple options can be selected)

a) .....
b) .....
c) .....
d) .....

☐ There was no change in the reuse of treated wastewater during the COVID-19 pandemic
☐ Usage of treated wastewater was suspended. This need was met by the network and/or other resources (.....)
☐ Usage of treated wastewater was continued by taking additional measures
(Measures taken: .....)
☐ Other

Please specify:
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Additional comments/suggestions:
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Sources

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2- EPA, "Do wastewater treatment plants treat COVID-19?", 2020.
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