

COVID-19 & WASTEWATER

TURKISH WATER INSTITUTE
SUEN
TÜRKİYE SU ENSTİTÜSÜ

September, 2020

DETECTING THE NOVEL CORONAVIRUS (SARS-CoV-2) IN WASTEWATERS: AN EARLY WARNING SYSTEM

Some countries conduct extensive scientific research to monitor the presence of the novel coronavirus (SARS-CoV-2) in wastewaters to fight against the COVID-19 pandemic as stool and urine of humans contain the virus regardless of one being symptomatic or asymptomatic.

These studies help identify the trends in outbreaks in a cost-effective manner that will enable authorities to take proactive and preventive measures against the virus.



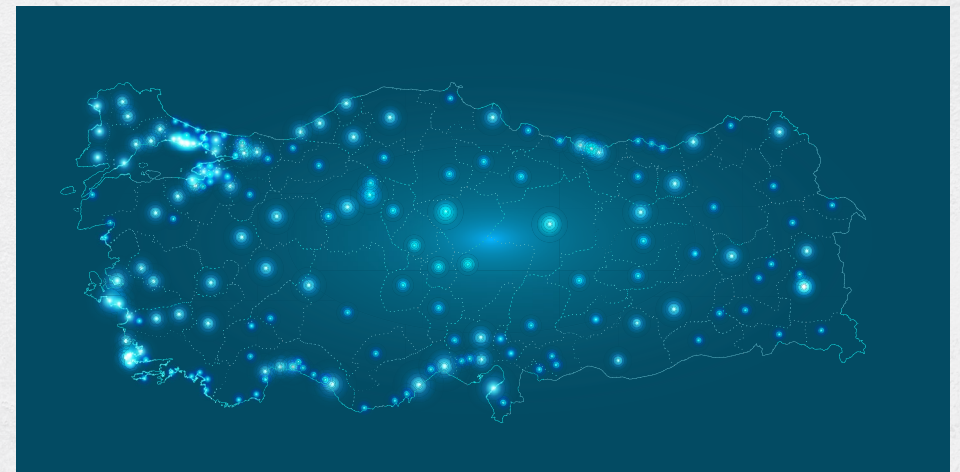


MAIN OBJECTIVE OF THE STUDY

The main objective of the “nationwide SARS-CoV-2 surveillance study in the wastewaters of Turkey” is to identify the regional distribution of the COVID-19 outbreak throughout the country by monitoring wastewater as a tool.



Continual monitoring of wastewaters for SARS-CoV-2 aims to provide an early warning sign in case of an infection resurgence. The results of the study will also determine if the treated wastewater can be reused for irrigation purposes.



PROJECT IN BRIEF

The study is commissioned by the Ministry of Agriculture and Forestry of Turkey through the coordination of Turkish Water Institute (SUEN) and with the support of State Hydraulic Works, GD of Food and Control and GD of Water Management all under the same ministry. Marmara University and University of Health Sciences support the project as scientific advisors.

Marmara University Department of Environmental Engineering acts as the principal investigator and scientific advisor for the project. Molecular analyses are performed at Istanbul and Samsun Veterinary Control Institutes of the GD of Food and Control under the scientific advisory of Health Sciences University. Samples are transported by the support of State Hydraulic Works.

Scanning for SARS-CoV-2 is accomplished in the influent and effluent samples as well as primary and waste activated sludge samples collected from 189 points (WWTPs and manholes) in the 81 cities. Viral activity and inactivity tests are also performed.



GEOGRAPHICAL SCOPE

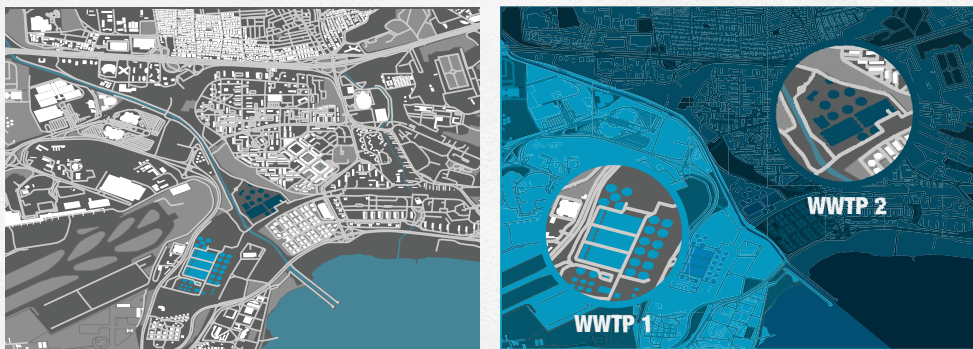
The scope of the study covers all 81 provinces in Turkey.





STEP 1: DETERMINATION OF SAMPLING POINTS

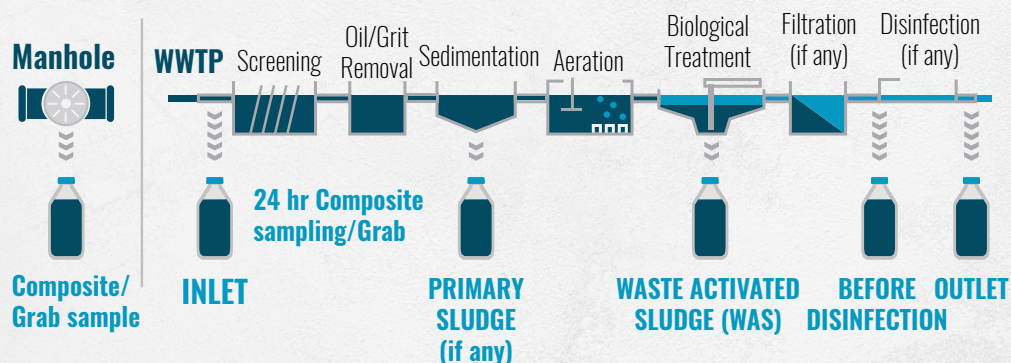
Sampling points are determined according to the basins where wastewater treatment plants and sewer networks collect wastewaters. Critical points such as pandemic hospitals are also taken into consideration in sampling.



Samples are taken from the chosen 189 points in 81 cities.

STEP 2: SAMPLE COLLECTION FROM WASTEWATER TREATMENT PLANTS AND MANHOLES

Samples are collected from selected manholes and inlets and outlets of the WWTPs, primary sludge (if any), waste activated sludge, before and after disinfection (if any).



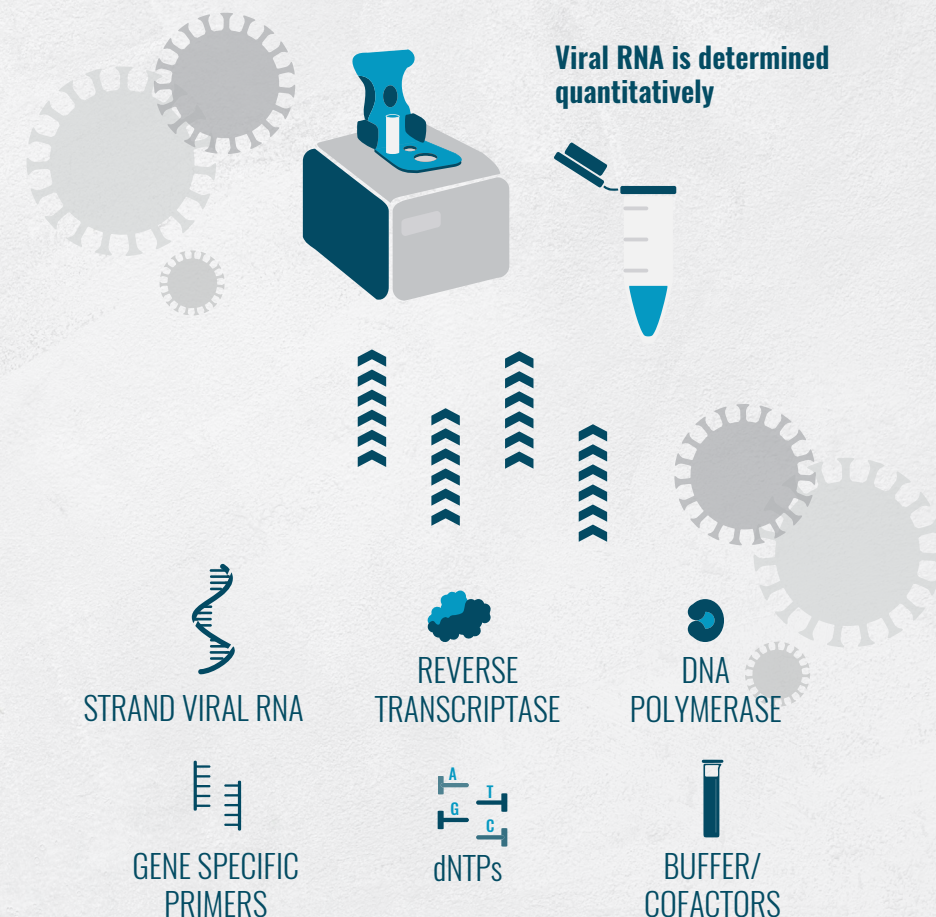
Data on influent characteristics (e.g. Q, BOD, COD, TKN, TP), environmental (e.g. weather, T), and operational (e.g. HRT, SRT) conditions of treatment plants are gathered.

STEP 3: TRANSPORTATION OF SAMPLE

Transportation to the BSL-2 laboratories is provided in compliance with cold chain (4°C) protocols.

STEP 4: RNA ANALYSIS of SARS-CoV-2 in WASTEWATERS

Samples are centrifuged and the supernatant is filtered. Virus is concentrated by means of the PEG8000 method. Total RNA extraction is performed on collected concentrate. RT-qPCR assays targeting RdRp gene are performed using a thermal cycler.



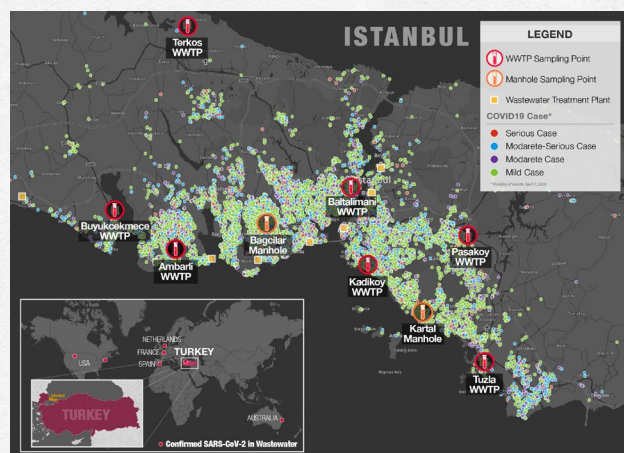


STUDY OUTCOME

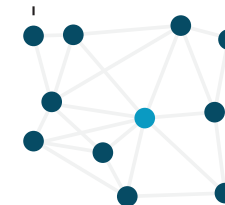
SARS-CoV-2 monitoring in wastewater may be a very useful tool to determine if there is an outbreak possibility in the community. The surveillance method is a demonstrated practice to protect public health.

Preliminary results of the study are published on

- *First Data-Set on SARS-CoV-2 Detection for Istanbul Wastewaters in Turkey*
<https://www.medrxiv.org/content/10.1101/2020.05.03.20089417v1>



- *SARS-CoV-2 Detection in Istanbul Wastewater Treatment Plant Sludges*
<https://www.medrxiv.org/content/10.1101/2020.05.12.20099358v1>



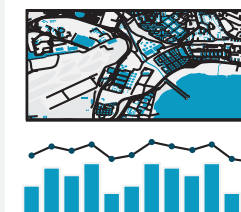
Epidemiological
Model



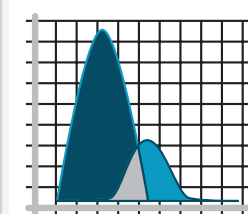
COVID-19
Surveillance



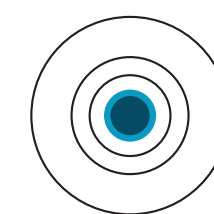
Risk
Assessment



Spatial and Temporal
Analysis



Current and Potential
Status of Pandemic



Hot Spots

**WASTEWATER-BASED EPIDEMIOLOGY
(MONITORING and EARLY WARNING)**

DISSEMINATION OF KNOWLEDGE AND EXPERIENCE

The knowledge and experience gained from the project have been shared with other countries in different platforms (list of events contributed to is given in appendix).



REPUBLIC OF TURKEY
MINISTRY OF AGRICULTURE
AND FORESTRY

TURKISH WATER INSTITUTE
SUEN
TÜRKİYE SU ENSTİTÜSÜ

VIRTUAL EVENT

24 AUG 2020 17:00-19:00
ISTANBUL GMT +3

zoom English | Turkish
WEBINAR ID 919 3361 7655
PASSCODE 3254992

LESSONS LEARNED FROM SARS-CoV-2 IN WASTEWATER SURVEILLANCE - GENOMICS - EARLY WARNING

- Can Covid-19 spread through water and wastewater?
- How should the general framework be for a nationwide SARS-CoV-2 surveillance study?
- Is it possible to develop an early warning system with wastewater surveillance?

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| Prof. Ahmet Mete Saatci Istanbul, TURKEY President, SUEN, Turkish Water Institute Governor and Member of the Governing Board of World Water Council (WWC) Coordinator of the Nationwide SARS-CoV-2 Surveillance in Wastewater Project in Turkey | Dr. Saatci will give an overview of importance of surveillance studies in wastewater and will acknowledge the current situation throughout the world. |
| Assoc. Prof. Bilge Alpaslan Kocamemi Istanbul, TURKEY Marmara University, Dept. of Environmental Engineering Scientific Advisor/Principal Investigator of Nationwide SARS-CoV-2 surveillance in Turkey | Dr. Kocamemi will present the detailed results of the nationwide SARS-CoV-2 surveillance project in wastewater and sludges of Turkey. |
| Prof. Kartik Chandran New York, USA Columbia University, Dept. of Earth and Environmental Engineering | Dr. Chandran will inform about the current situation in the US and will discuss viral diversity and fate in sewage treatment and fecal sludge treatment processes. |
| Jay Bhagwan Pretoria, SOUTH AFRICA Executive Manager: Water Use and Waste Management at the South African Water Research Commission | Mr. Bhagwan will talk and share the initiatives and early results on establishing a national COVID-19 wastewater and non-sewered surveillance programme in South Africa. |
| MODERATOR Assist. Prof. Esra Erdim Istanbul, TURKEY Marmara University, Dept. of Environmental Engineering | Closing & Point of Discussion, The moderator will pass the following questions for every panelist and close the webinar. |

ONGOING AND FUTURE STUDIES

- Effects of operational parameters of WWTPs on fate and concentration of SARS-CoV-2
- Regular sampling and analysis from designated points (e.g. touristic resorts, dorms, metro stations)
- Next Generation Sequence Analysis: Determining variances, relationship between similar countries
- Epidemiological Benchmarks COVID-19
- qPCR data correlations with treatment plant data

PROJECT TEAM AND COLLABORATION

This project was financed by the Ministry of Agriculture and Forestry of Republic of Turkey with the coordination, execution and scientific support of following institutions.

Ministry of Agriculture and Forestry of Turkey

- Turkish Water Institute (SUEN) (Coordinating Unit)
- General Directorate of Food and Control (Analyses)
- General Directorate of State Hydraulic Works (Sample Collections and Transfers)
- General Directorate of Water Management (WWTP Inventory)

Marmara University, Department of Environmental Engineering (Principal Investigator and Scientific Advisory)

University of Health Sciences, Hamidiye International School of Medicine, Department of Medical Biology (Scientific Advisory)



LIST OF EVENTS CONTRIBUTED TO (1)

| Date | Event | Topic | Speaker |
|------------|---|---|--|
| 27.04.2020 | Union for the Mediterranean IME/UfMs 2 nd "Brainstorming Session on Water, Sanitation and COVID-19", Spain | Brainstorming Session on Water, Sanitation and COVID-19 | Prof. Dr. Ahmet Mete Saatçı |
| 04.06.2020 | 76 th Scientific Community Meeting European Environment Agency of European Union | SARS-CoV-2 Detection in Wastewater | Prof. Dr. Ahmet Mete Saatçı |
| 08.06.2020 | "1 st Town Hall Meeting" ENV, Water Europe and EurEau | SARS-CoV-2 Monitoring Employing Sewers a First Gathering to Share Knowledge | Dr. Halil Kurt |
| 08.06.2020 | Chamber of Environmental Engineers (ÇMO), Turkey | COVID-19 Tracing in Turkey's Wastewaters | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 17.06.2020 | Word Water Council, France | SARS-CoV-2 Detection of Wastewater and Sludges in Turkey | Prof. Dr. Ahmet Mete Saatçı |
| 17.07.2020 | "SARS-CoV-2 in Sanitation and Wastewater Sludge" Portuguese Association of Water and Wastewater services (APDA), Portugal | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in all of the 81 Cities in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 22.07.2020 | "2 nd Town Hall Meeting /UN – WWQA Part 2 Meeting" EU Umbrella Study @ UN World Water Quality Alliance | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in all of the 81 Cities in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 22.07.2020 | "TAIEX Online Workshop on Wastewater Use in Sanitation Systems" Technical Assistance and Information Exchange (TAIEX), Turkey | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in all of the 81 Cities in Turkey Wastewater in Sanitation Systems | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 23.07.2020 | "COVID-19 Implication on Water Management in Megacities" UNESCO | COVID-19 Surveillance Study for Wastewater and Sludges in Istanbul | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |

LIST OF EVENTS CONTRIBUTED TO (2)

| Date | Event | Topic | Speaker |
|------------|---|--|---|
| 19.08.2020 | "WRC/SALGA Programme on Water Quality, Sanitation and Health in light of COVID-19" South African Local Government Association (Salga), Water Research Commission (WRC) | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in all of the 81 Cities in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 23.08.2020 | G20 Water Deputies Meeting | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in all of the 81 Cities in Turkey | Burcu Çallı |
| 27.08.2020 | Turkish Water Institute (SUEN), Turkey | Lessons Learned from SARS-CoV-2 in Wastewater: Surveillance, Genomics, Early Warning | Prof. Dr. Ahmet Mete Saatçı Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 11.09.2020 | "8 th series Mini-Conference WWN SARS-CoV-2 in wastewater: State of the Knowledge and Research Communication" American Society of Civil Engineers (ASCE) Women-Water Nexus | SARS-CoV-19 Surveillance Study for Wastewater and Sludges in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 23.09.2020 | Innovation Pathway 2020 Águas do Tejo Atlântico, Portugal | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 30.09.2020 | "Online Workshop COVID-19 Research and Innovation Programmes and Projects" Water Research Commission of South Africa and Indian Ocean Rim Association (IORA) | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |
| 30.09.2020 | "Wastewater and COVID-19: Getting the Facts Right" The United Nations Environment Programme (UNEP) | SARS-CoV-2 Surveillance Study for Wastewater and Sludges in Turkey | Assoc. Prof. Dr. Bilge Alpaslan Kocamemi |

Notes:

This image shows a full page of a handwriting practice worksheet. It consists of multiple rows of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.



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