

COVID-19 & WASTEWATER

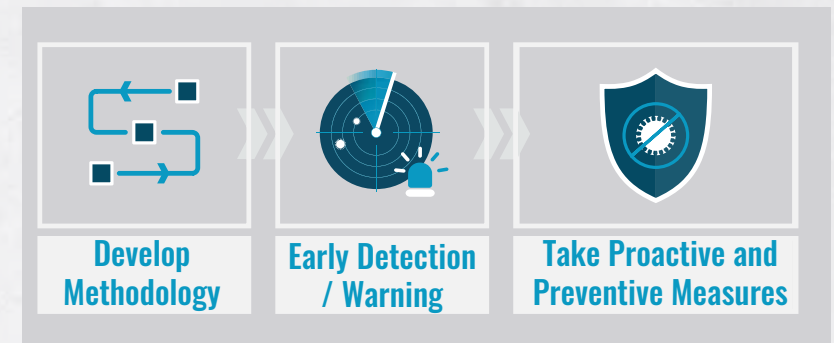
TURKISH WATER INSTITUTE
SUEN
TÜRKİYE SU ENSTİTÜSÜ

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.



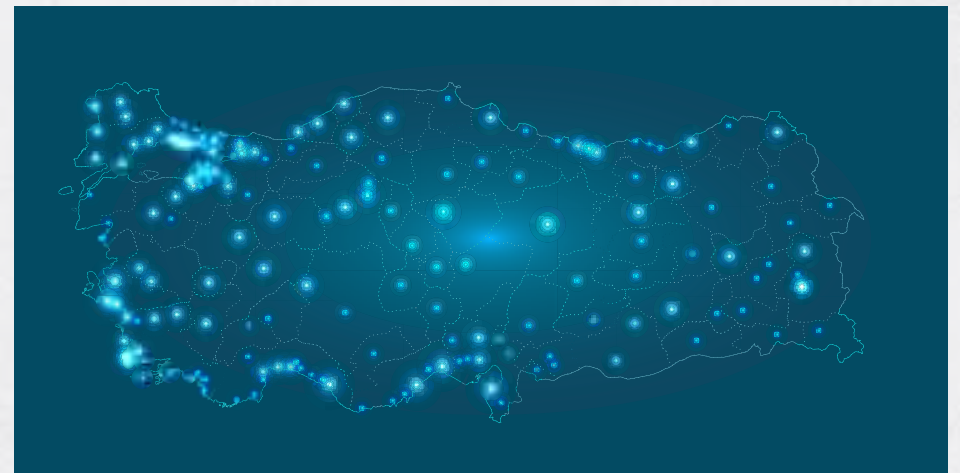


MAIN OBJECTIVE OF THE STUDY

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

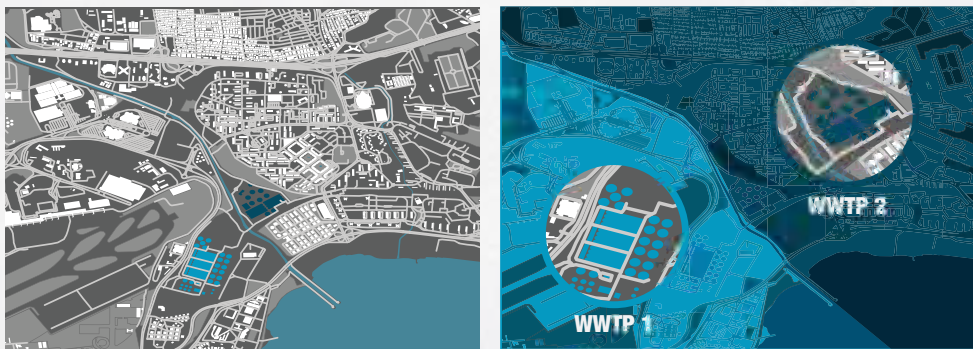
The scope of the study covers all 81 provinces in Turkey.





STEP 1: DETERMINATION OF SAMPLING POINTS

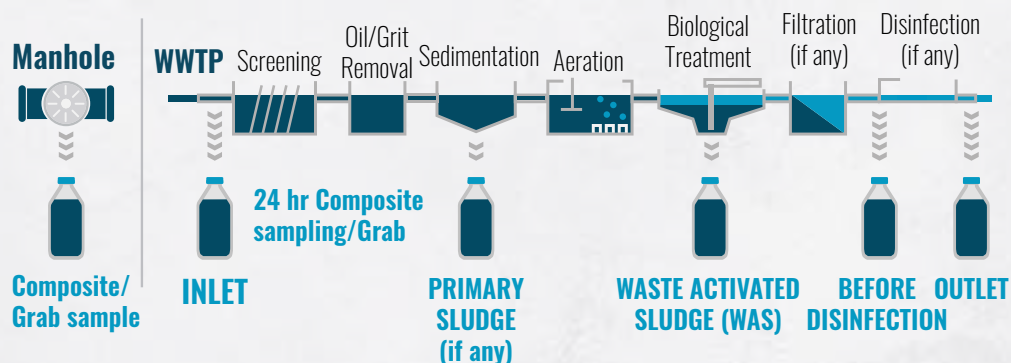
Sampling points are determined according to the basins where wastewater treatment plants and sewer networks collect wastewaters. Critical points such as pandemic hospitals are also taken into consideration in sampling.



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).



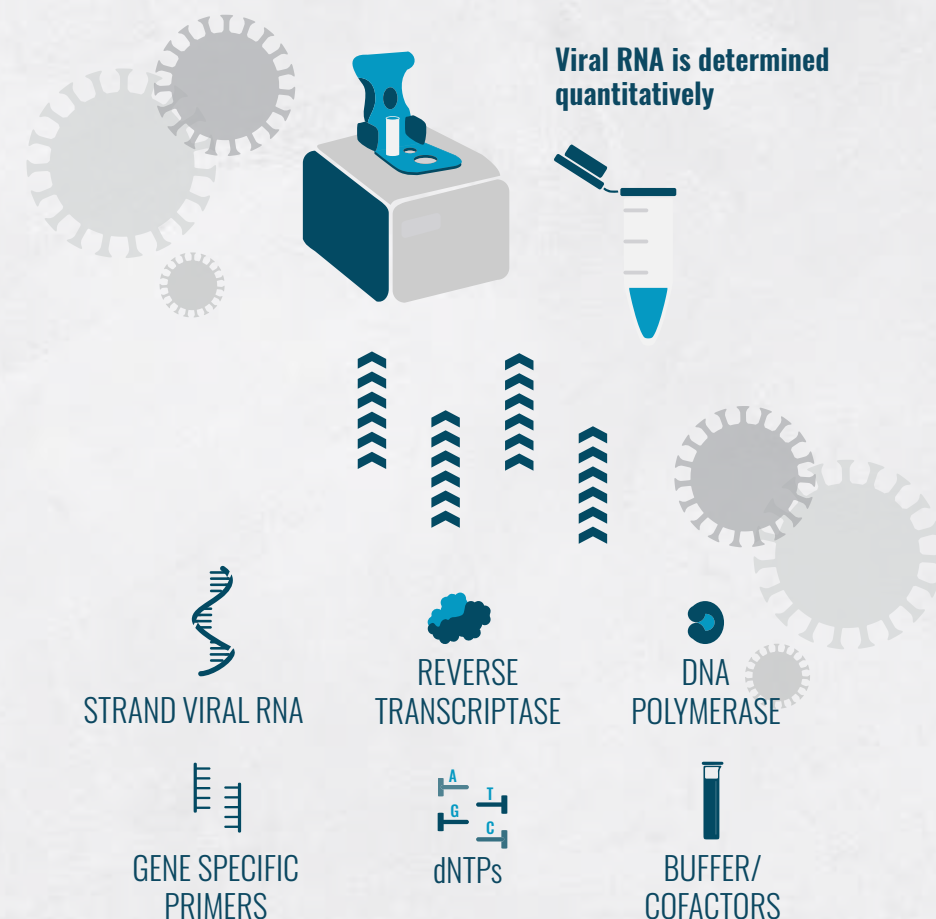
Data on influent characteristics (e.g. *Q*, *BOD*, *COD*, *TKN*, *TP*), environmental (e.g. *weather*, *T*), and operational (e.g. *HRT*, *SRT*) conditions of treatment plants are gathered.

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

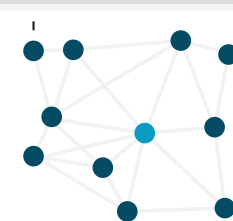
SARS-CoV-2 monitoring in wastewater may be a very useful tool to determine if there is an outbreak possibility in the community. The surveillance method is a demonstrated practice to protect public health.

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>



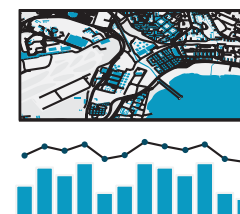
**Epidemiological
Model**



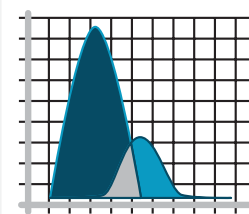
**COVID-19
Surveillance**



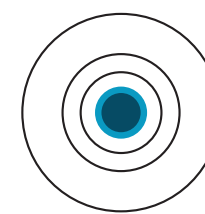
**Risk
Assessment**



**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).



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

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