AIT Asian Institute of Technology

UN environment programme 50 1972-2022

TURKISH WATER INSTITUTE SUEN TÜRKİYE SU ENSTİTÜSÜ

WEBINAR

COVID-19 and the WATER SECTOR

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by SARS-CoV-2 Wastewater Surveillance

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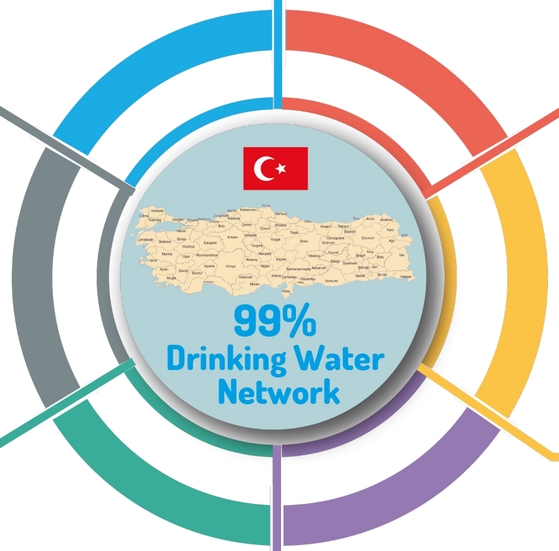
WATER SECTOR Responses in Turkiye During COVID-19

CHANGES in WATER DEMAND

- 5% - 30 % increase in domestic water use
- 14% decrease in non-industrial commercial water use
- 10% - 14% decrease in industrial water use

WATER SERVICES

- Undisrupted water services
- Contingency plans for workforce
- Contingency plans for imported chemicals



VULNERABLE GROUPS

- Cancelling water shutoffs
- Restorage of disconnected water services
- Lowering water tariffs in some locations
- 7/24 emergency call line
- Social solidarity campaigns : *"pay-it-forward (bill on the hook)"* practice
- Paying bills through social funds of municipalities
- Hygiene set distribution

CHANGES in TREATMENT PROCESS SCHEME

- Scale up of residual chlorine concentration
- More frequent water quality monitoring at the exit of treatment plant and various points of network
- Activity tests for SARS-CoV—2

HUMAN RESOURCES

- Administrative leave for staff with chronic illness
- Re-organization of shifts
- Staff reservations, Staff rotations
- Personel Protection Equipment (Masks, gloves etc.)
- Regular fever measurements
- Lunch box system
- Periodic disinfection of common areas, shuttle vehicles
- Social distancing, warning signs, remark labels
- Quarantines of Covid-19 workers with paid-leave

PROCUREMENT of CHEMICALS and EQUIPMENT

- Increase in prices of chemicals and equipment up procured from abroad
- Prioritization of compulsory maintenance, repair, investment activities

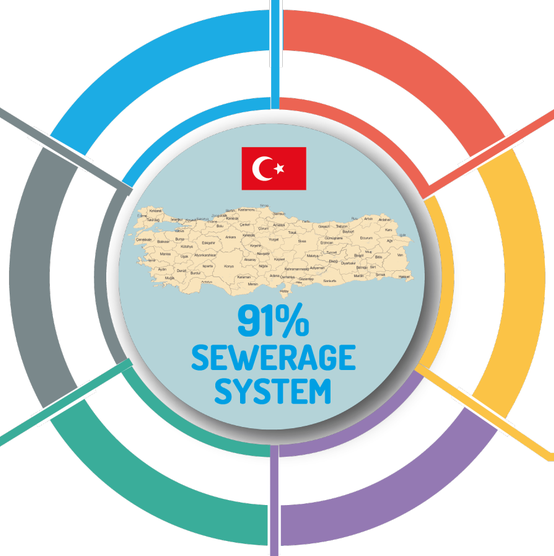
WASTEWATER SECTOR Responses in Turkiye During COVID-19

WASTEWATER SERVICES

- Undisrupted wastewater services
- Contingency plans for workforce
- Contingency plans for imported chemicals (e.g. polymers)

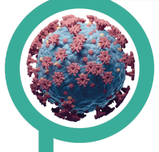
HUMAN RESOURCES

- Administrative leave for staff with chronic illness
- Re-organization of shifts
- Staff reservations, Staff rotations
- Personel Protection Equipment (Masks, gloves etc.)
- Regular fever measurements
- Lunch box system
- Periodic disinfection of common areas, shuttle vehicles
- Social distancing, warning signs, remark labels
- Quarantines of Covid-19 workers with paid-leave
- Extra protection against aeresols on aeration facilities



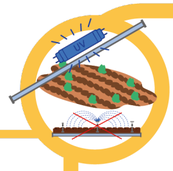
PROCUREMENT of CHEMICALS AND EQUIPMENT

- Increase in prices of chemicals and equipment procured from abroad
- Prioritization of compulsory maintenance, repair, investment activities



TRANSMISSION POSSIBILITY of COVID-19

- Activity (infectivity) tests for SARS-CoV—2 influent, effluent, primary and waste activated sludge



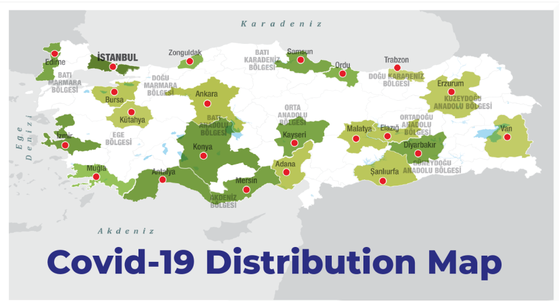
CHANGES in TREATMENT PROCESS SCHEME

- Temporary chlorination of effluent as a back up of UV disinfection
- No use of treatment plant sludges for agriculture activities

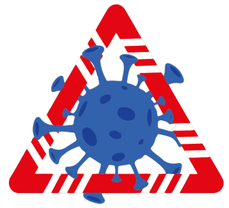
WASTEWATER BASED EPIDEMIOLOGY (WBE) STUDIES

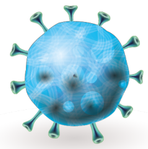
- To monitor Covid-19 spread and distribution
- To develop an early warning system for new waves
- To monitor VOIs (Variant of Interest) and VOCs (Variant of Concern)

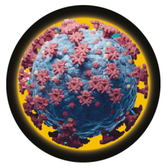
Nationwide Tracking of Covid-19 Spread in Turkiye by SARS-CoV-2 Wastewater Surveillance

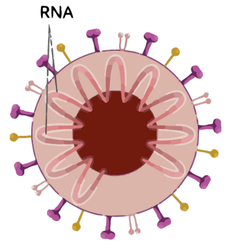


Covid-19 Distribution Map

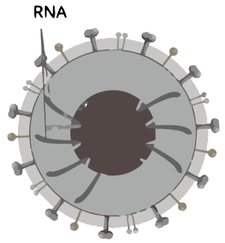

EARLY WARNING!


Variant of Concern (VOC)


Variant of Interest (VOI)



Active Virus



Inactive Virus

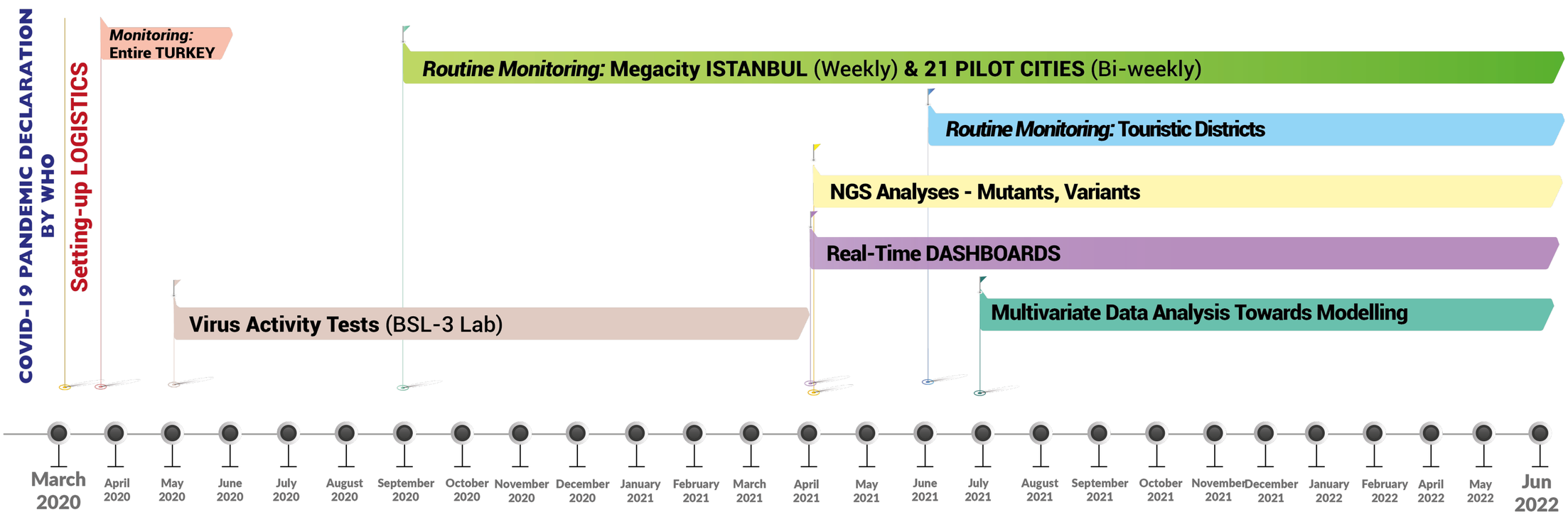
I. To monitor Covid-19 spread and distribution

II. To develop an early warning system for new waves

III. To monitor VOI and VOCs

IV. To monitor infectious SARS-CoV-2 in wastewater

https://covid19.tarimorman.gov.tr



Global SARS-CoV-2 WBE Studies

in the Netherlands:
March 2020

8 STPs, Airport

in Turkey:
April 2020

Nationwide
81 Cities
189 STPs

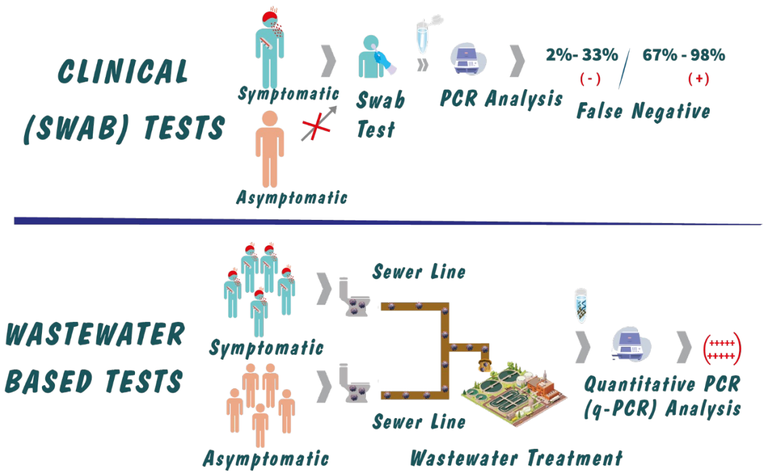
Access Date: 12.06.2022

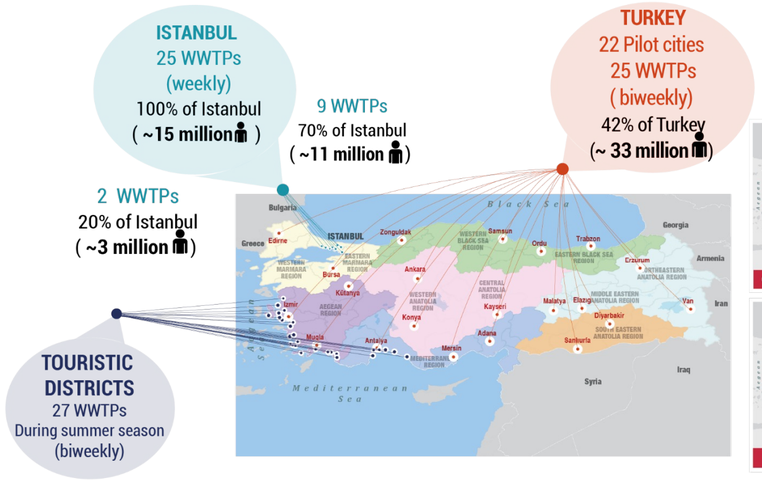
Dashboards	Universities	Countries	Sites
146	279	67	3,393
Last update: 13 minutes ago	Last update: 13 minutes ago	Last update: 13 minutes ago	Last update: 13 minutes ago

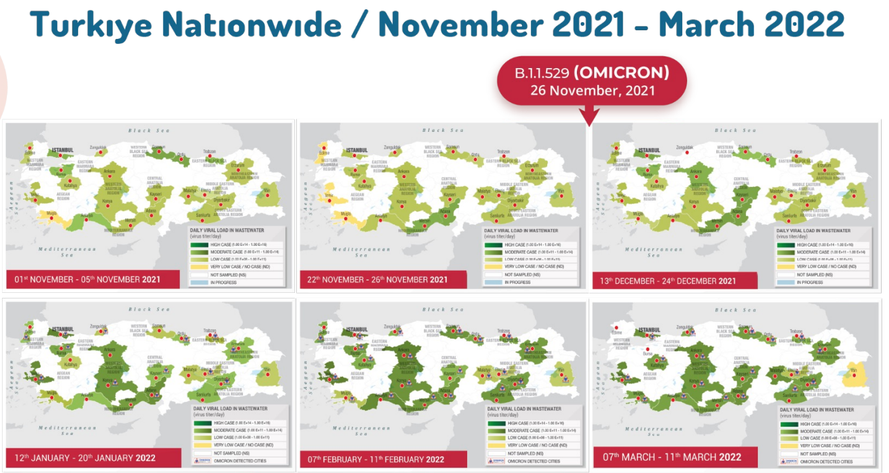
https://www.covid19wbec.org/covidpoops19

Benefits of Covid-19 WBE Studies

I. Quick, Economic and Reliable Scanning of Population







II. Identification and Detection of Variants

Amplicon Sequencing
NEXTFLEX® Variant-Seq™
SARS-CoV-2 with Artic primers V3

Reference Sequence	Pangolin Lineage	Nextclade Clade	Covered Bases	% Bases Covered	Average Base Coverage	% of gencme greater than 100x depth	% of genome greater than 30x depth
SARS-Cov-2	None	20C	20084	67.16	441.482	61.49	65.32

Table 1: Coverage Statistics for the sequenced SARS-CoV-2 genome.

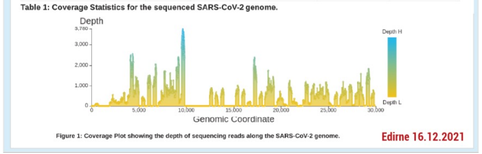


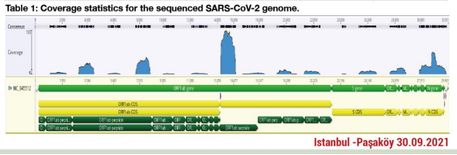
Figure 1: Coverage Plot showing the depth of sequencing reads along the SARS-CoV-2 genome.

Edirne 16.12.2021

Oxford Nanopore Sequencing
SARS-CoV-2 Midnight Primers

Reference Sequence	Covered Bases	% Bases Covered	Average Base Coverage	% of genome greater than 25x depth	% of genome greater than 5x depth
NC_45512_SARS_CoV2_ NCBI_refseq	15825	52.9	14.12	7.72	31.16

Table 1: Coverage statistics for the sequenced SARS-CoV-2 genome.

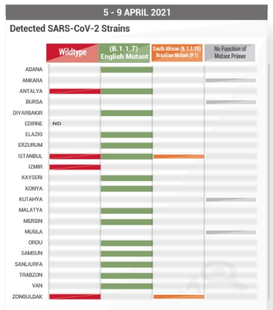


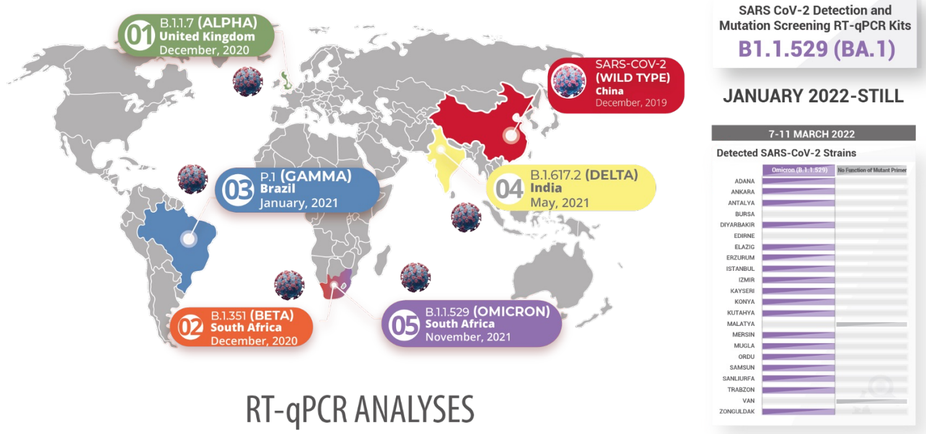
Istanbul -Paşaköy 30.09.2021

NGS ANALYSES

SARS CoV-2 Detection and Mutation Screening RT-qPCR Kits
B.1.1.7, P.1, B.1.351

APRIL - JUNE 2021



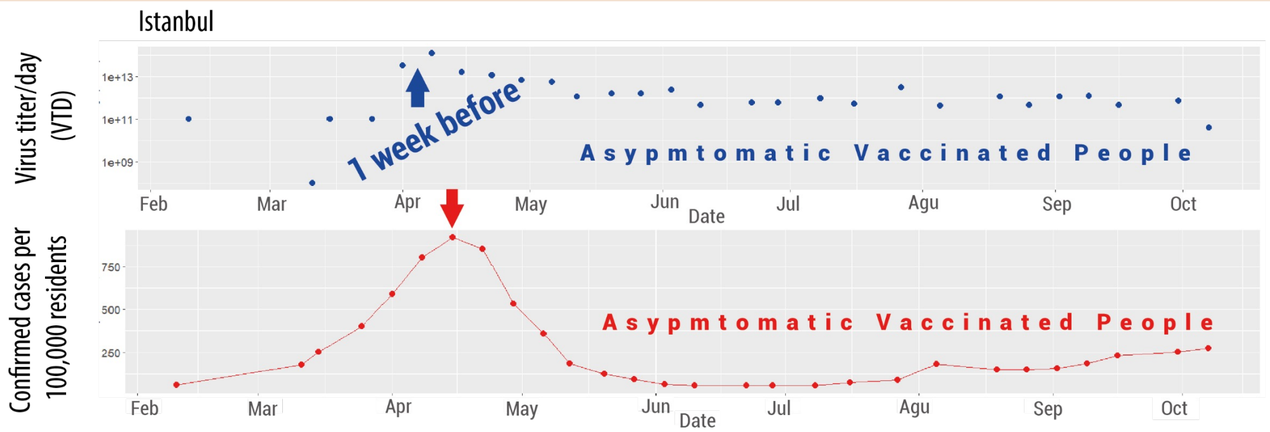


RT-qPCR ANALYSES

SARS CoV-2 Detection and Mutation Screening RT-qPCR Kits
B1.1.529 (BA.1)

JANUARY 2022-STILL

III. Early Warning



Challenges of COVID-19 WBE Studies

Interdisciplinary team
(Desicion makers, Scientist, Virologists, Municipalities and WWTPs staff)

Long Measurement time
Need for pre-concentration methods

Seasonal factors

Availability of consumables

Availability of BSL2 – BSL3 Labs

Man-power

Funding Sources

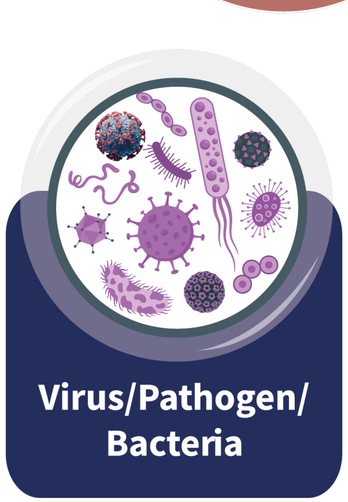
Use of data by authorities

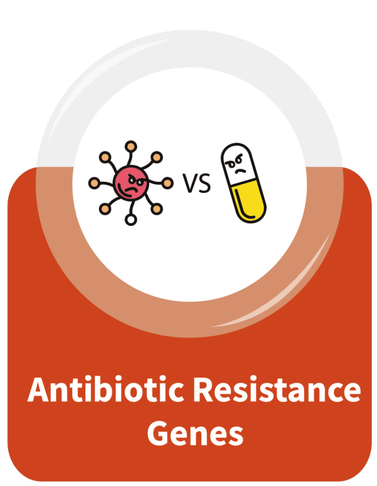
Future Perspectives of Sewage Surveillance Studies

ONE HEALTH APPROACH

American Veterinary Medical Association (2006) - FAO-OIE-WHO (2008)

Global health security by mapping human, animal and environmental health at national and global levels





- Food Security
- Sustainable Agriculture
- Zoonotic Diseases (diseases that jump from animal to human)
- Combat Antibiotic resistance

- **Early warning for new waves of Covid-19 and other possible pandemics**
- Systematic monitoring of viruses and pathogens in wastewater
  Critical for Re-use of wastewater for Irrigation
- Systematic monitoring of Antibiotic Resistant Genes and Antibiotic Resistant Pathogens
  Proliferation of Antibiotic Resistant Genes in wastewater irrigated soil

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THANK YOU!

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