

COVID and Wastewater: Mind the Poop!

Outcome Brief

Third session: COVID and Wastewater – Mind the poop!

16 June 2020, 13:30 – 15:00 CEST

248 Participants

Gender balance: 43% female, 57% male

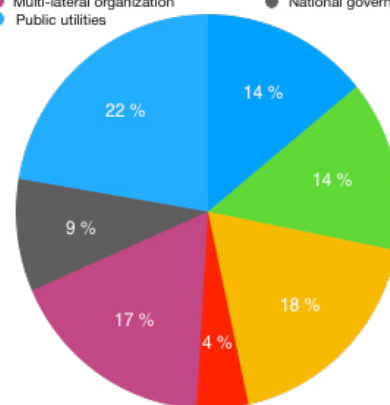
Regional representation

● Africa ● Asia & Pacific ● MENA ● LAC ● Europe
● North America



Type of organization

● Academia ● Business
● Civil society organization/ NGO ● Local government
● Multi-lateral organization ● National government
● Public utilities



Introduction

Wastewater utilities are key actors in maintaining water quality and managing risks to public health, food security and other ecosystem services and functions. The monitoring of wastewater is important for a variety of health and environmental reasons, as well as in other areas such as augmenting freshwater supplies (water scarcity), understanding and enhancing operational efficiency and addressing diffuse sources of pollutants. Moreover, wastewater utilities worldwide produce large amounts of data which could be utilized to inform national and global reporting on progress towards achieving Sustainable Development Goal Target 6.3 on wastewater treatment.

The tracking of COVID-19 brings new relevance to this topic. Monitoring wastewater systems for viral loads has long been a common method to track infections in urban populations, most notably the effects of vaccination against polio-virus. Studies on COVID-19 have shown that the virus is shed in faeces and hence collected in the sewerage systems in cities, where such systems exist. As cities continue to grapple with how to monitor and manage the spread of COVID-19 in the medium to long-term, wastewater and faecal sludge monitoring can potentially serve as a cost-effective “early-warning” mechanism to identify hotspots.

The webinar brought together experts in the urban sanitation and wastewater fields with wastewater utilities and practitioners from different regions to hear about their challenges, solutions and outlooks. Key questions addressed were: What good practices exist with regards to monitoring of wastewater? What are the opportunities for using wastewater to track COVID-19 infection spread? How is an open and collaborative partnership ensured with health authorities and other government partners? How are residents being provided with accurate and appropriate information about the COVID-19 status in their community?

The latest science on wastewater monitoring for the SARS-CoV-2 virus

The webinar opened with a keynote by **Prof. Kartik Chandran**, Professor of Environmental Engineering, Columbia University who gave an overview of recent studies into the Viral diversity and fate in sewage treatment and fecal sludge treatment processes. He particularly described research undertaken in India at six sewage treatment plants and three fecal sludge treatment plants to analyze the viral composition through DNA and RNA sequencing.



In samples from sewage treatment plants in the United States taken during the COVID-19 crisis, it was found that the SARS-CoV-2 was not significantly impacted by chlorination as practiced in the context of conventional wastewater treatment (and not SARS-CoV-2 specifically). Nevertheless, results indicate that the SARS-CoV-2 virus is likely associated with solids (enveloped virus) and that the influent load is generally reduced during the wastewater treatment process.

In pre-pandemic studies from three fecal sludge treatment plans in India, an overall decrease in RNA viruses was found during the treatment process. However, coronaviruses were not detected at high abundance, potentially suggesting non-SARS-CoV-2 infected communities prior to the pandemic.

Prof. Kartik concluded that non-sewered sanitation systems should be looked at further in terms of how shedding of viruses occurs and how they can be used to separate human pathogenic waste from other wastewater streams.

A second technical presentation was given by **Dr. Christoph Ort**, Group Leader, Department of Urban Water Management, Swiss Federal Institute of Aquatic Science and Technology ([EAWAG](#)) on SARS-CoV-2 in Wastewater – Findings and developments in Switzerland. He described studies based on samples collected in twelve wastewater treatment plants that cover almost one million people in Switzerland. Findings suggest a correlation of SARS-CoV-2 load with COVID-19 infection rate over time, however, estimates of the actual load remain low and semi-quantitative compared to the known quantity of people that are shedding the virus into the sewershed. Key areas for future research are on how to develop sampling protocols and analysis methods, how to determine the proportion of the viral load that can be recovered from the samples.

Dr. Ort concluded that there is evidence to suggest that wastewater monitoring can be used as an early warning system, however, further research is needed in order to determine 1) ‘by how many days’, 2) what a lower limit of quantification depends on and 3) the quantification of an estimated number of infected people. The current efforts to develop the science on these issues should not just bear in mind a second COVID-19 wave, but also future diseases.



Utilities' Experiences from Around the World

The webinar brought together wastewater operators and practitioners from four continents who shared experiences and perspectives on wastewater monitoring, facilitated by:

Mr. Nitya Jacob
[SuSanA India Chapter](#)
[Swasti](#)



The panel discussion comprised the following four representatives:

Mr. Sam Azimi
SIAAP
Paris, France



Eng. Alejandro Barrio
AySA
Buenos Aires, Argentina



Mr. Sasidharan Velayutham
IWK
Malaysia



Mr. Fred Nuwagaba
GIZ
Uganda



Experiences, successes and challenges on wastewater monitoring for COVID-19 and other water quality parameters

- As wastewater operators expand their coverage and improve their services, their monitoring systems for water quality provides comprehensive information on populations and the environment, as well as on compliance with government directives.
- Some utilities (particularly in Europe and North America) have been successfully detecting genetic material of SARS-CoV-2 in wastewater, mostly as preliminary steps to establish larger surveillance systems to provide early warnings of COVID-19 infection. AySA (Argentina) and SIAAP (France) have developed tools and protocol to forecast new waves.
- Research projects are underway in several countries to determine the potential for detection of COVID-19 outbreaks in the population or community via monitoring of wastewater. In some cases, results of such studies are delayed as available test kits are prioritized for clinical testing of suspected COVID-19 patients.
- As operators often cover large populations spread across a vast territory, attention is needed on the development of strategies to delineate smaller areas for more targeted tracing when test results for SARS-CoV-2 are found positive.

- When recovering the SARS-CoV-2 genetic material, the characteristics of effluents have been a challenge (AySA), especially in areas with high volumes of industrial (non-human) wastewater discharge.
- Precautionary measures to protect workers from direct exposure to wastewater remains an important priority, and normal measures should be sufficient in order to also protect workers from COVID-19.
- There is potential to further examine wastewater from non-sewered communities (On-site Sanitation Systems). Such systems do not have the interference from industrial and other sources of wastewater. However, sampling them is more complicated due to the geographic distribution, and recovery of viral material may be challenging due to inhibition factors.

Perspectives on collaboration with health authorities and communication with communities

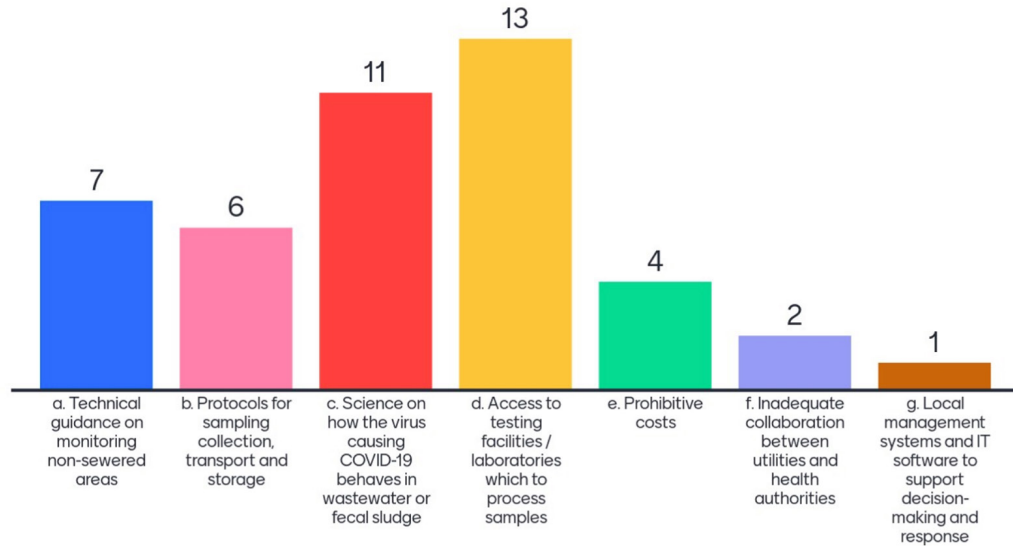
- Wastewater monitoring is a replacement for other tools to track and trace COVID-19 infection, but complements systems that provide information for health authorities to take appropriate action to prevent and respond to outbreaks.
- It is important to note that genetic material of the SARS-CoV-2 virus will be found in wastewater for as long as it is present in the population, but wastewater is not believed to be a primary infection route. The main rationale behind monitoring wastewater for SARS-CoV-2 is to monitor the changes in the quantity of the virus over time and hence forecast new outbreaks. The usual hygiene measures to protect people from wastewater are believed to be sufficient to also protect from COVID-19 infection.
- Transparent and collaborative partnerships between wastewater operators and government entities such as health authorities are important in order to ensure adherence to the relevant policies and standards. IWK Malaysia provided an example where several of their officers are trained by the Department of Environment and ensures that environmental requirements are monitored and managed, serving as shadow enforcement officers.

Key messages and recommendations

- Monitoring wastewater for SARS-CoV-2 is useful to follow the trends of the pandemic and for early warning. More research is needed in order to accurately determine the quantity of cases of COVID-19 that corresponds to a certain viral load in the wastewater. The viral load to a given sewage or fecal sludge treatment process could itself be influenced by various physical, chemical and environmental factors as well as the characteristics of the sewer shed or fecal sludge conveyance processes.
- Wastewater monitoring in areas that rely on non-sewered on-site sanitation systems should be further explored. Fecal Sludge Treatment Plants could be possible points of sampling, given the challenges of the vast distribution of on-site systems.
- Global exchange between utilities and wastewater monitoring experts and researchers is important, especially as the topic is fast evolving, in order to share data, sampling and analytical protocols and good practices. This type of collaboration should be continued and deepened in order to scale up wastewater monitoring.

Three polling questions were put forward to participants with the following responses:

Biggest gaps to scale up COVID-19 wastewater surveillance in developing countries?



Who do you look to for technical advice and guidance on wastewater monitoring?



Case studies of Wastewater Monitoring to Track COVID-19 infection

Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP), France

Total population in the service area 9 M	Coverage ratio (population served/total population) for water >99%	No of connections -
% of people in the service area living in informal settlements -	Coverage ratio (population served/total population) for sanitation >99%	No of employees 1,925

Key actions and challenges

- In the beginning of March, SIAAP started sampling the wastewater in their treatment plants in the city of Paris, France, and a high concentration was already spotted even though the number of infections were still low – this confirms the wastewater monitoring can be used to follow the behaviour of the pandemic and be an “early warning” system to track the virus.
- The wastewater treatment plants are heavily equipped for monitoring COD, BOD and other common parameters. All wastewater treatment and monitoring processes follow the EU Water Framework Directive (WFD).
- Difficulty in finding standardized and effective methods to estimate the concentration of SARS-CoV-2 in the sewage to, for example, estimate how and if RNA and DNA-virus genes remain infectious.

Main suggestions for improvement

- Creation of an Observatory on Sewages to track the behaviour and evolution of the population on one hand, and bacteria, viruses and other pathogens on the other
- Creation of an Epidemiologic Observatory to serve as a hub for knowledge sharing among scientists and wastewater utilities.
- Use the data obtained by the monitoring as a decision-making tool to help wastewater operators.

Agua y Saneamientos Argentinos (AySA), Argentina

Total population in the service area 14,400,000	Coverage ratio (population served/total population) for water 75%	No of connections 2,300,000
% of people in the service area living in informal settlements 10%	Coverage ratio (population served/total population) for sanitation 62%	No of employees 7,900

Key actions and challenges

- Development of a monitoring tool following the steps from other European countries, such as Spain – collaboration with Aguas de Murcia.
- Creation of a team of wastewater professionals and researchers from AySA with the aim to develop a technique to monitor wastewater. The results of this technique have shown there is genetic material of the virus in the sewage liquids.
- 80 samples of the genetic material have been collected following these steps: determining the concentration of genetic material, ensuring effective extraction processes, verification of its purity, and discarding the samples with interference from other residues. Later, the PCR technique has been used for further analysis.
- A tool for epidemiologic surveillance has been developed and it will be shared with the Ministry of Health in order to help them in the decision-making process to establish the strategies used for monitoring.
- Difficulty in extracting reliable genetic material not polluted by other residues.

Main suggestions for improvement

- It has been proved that the faeces from patients infected by the virus contain its genetic material – therefore, sampling

for the virus can be an effective monitoring strategy to identify potential COVID-19 hotspots.

- It is most important to focus on and monitor targeted smaller areas, at neighborhood level, to localize the presence of the virus and anticipate potential new outbreaks.
- Essential to collaborate with national authorities and to communicate to the population that new ways to track COVID-19 are being studied which are complementary to the existing ones.

Indah Water Konsortium (IWK), Malaysia

Total population in the service area 34 M	Coverage ratio (population served/total population) for water 96.4%	No of connections 4.7 M
% of people in the service area living in informal settlements 10%	Coverage ratio (population served/total population) for sanitation 99.6%	No of employees 3,352

Key actions and challenges

- 5 regional laboratories with a capacity to test 25,000 samples of wastewater on each – collection of samples made daily.
- IWK is not monitoring the wastewater for SARS-CoV-2 mainly due lack of test kits – all the kits are being used for clinical testing of patients. IWK have collected wastewater samples which are pending testing.
- The utility is monitoring its workers at wastewater treatment plants in ensuring staff safety and continuity of this essential service. This has been done mainly by providing additional PPE.
- IWK is relying on the advise from the Ministry of Health and collaboration with the Department of Environment. They also rely on the available information about wastewater and COVID-19 from authorities such as WHO.

Main suggestions for improvement

- The alerts that may arise from the results of the tests should be immediately issued to the plant owners so they can take immediate action, while the information is transparently communicated within the utility, and to communities through governmental authorities.

Sanitation for Millions programme, GIZ , Uganda

Total population in the service area 1.5 M	Coverage ratio (population served/total population) for water 84%	% Sewerage service <10%
% of people in the service area living in informal settlements 60%	Coverage ratio (population served/total population) for sanitation -	% OSS service > 90%

Key actions and challenges

- Direct collaboration with Kampala Capital City Authority, National Water and Sewerage Corporation and partnership with the Water and Sanitation National Task Force led by the Ministry of Health, among other actors.
- Regular announcements are given to the population by the Ministry of Health – utilities from Uganda are also part of this communications team.
- Water and wastewater utilities are not yet tracking the presence of SARS-CoV-2 – their focus is mainly on the continuity of service, increasing the use of PPE among workers, and on identifying the best sources to get knowledge about the link between wastewater monitoring and identifying COVID-19 hotspots.

Main suggestions for improvement

- Utilities and other authorities fighting the virus are currently mainly focusing on how to improve the current measures to prevent further infections.

Resources

Session Resources

[GWOPA COVID-19 webinar series](#)

[GWOPA YouTube channel](#)

Further resources

[GWOPA COVID-19 Updates](#)

[UN-Habitat COVID-19](#)

Let the discussion continue!

Webinars often raise more questions than they can answer. To facilitate further discussion, exchange and learning among webinar participants and the audience, GWOPA/UN-Habitat has opened a Workplace group. If you would like to be invited to this group to exchange questions, ideas and resources with others about water utilities and COVID-19 challenges, please kindly send an email to info@gwopa.org




GWOPA

Global Water Operators' Partnerships Alliance

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