Paris, France

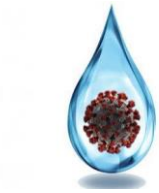
About the IWA Action Agenda for Basin-Connected Cities

IWA Action Agenda for Basin-Connected Cities which builds on the Principles for Water Wise Cities, with a focus on how cities can be active water stewards in their wider water basins. This includes the Drivers for Action such as extreme events, declining water quality, and water availability; followed by the Pathways to Action through assessment, planning and implementation; and the Foundations for Action from developing a vision to building capacity to improving governance. To learn more visit - http://www.iwa-network.org/press/the-action-agenda-for-basin-connected-cities/

About the Basin Stories

The basin stories are documenting some of the best practices and approaches that demonstrate how stakeholders especially those in urban areas (city government, water and wastewater utilities, industries) are taking part or contributing to sustainable management of water resources. Greater basin-level collaboration from catchment to consumer is essential for sustainable water management in the face of growing demand on water resources and global change. The stories aim to inspire urban stakeholders to be aware and respond to what is happening in their watershed.

Obépine: a unique observatory to monitor SARS-CoV2 in wastewater



Source: Sorbonne Université, 2020

Contributed by: Tristan Milot, Project manager, Syndicat Interdépartemental pour l'assainissement de l'agglomération Parisienne (SIAAP)

Summary:

Paris is the capital of the French Republic, and the most important city in the country in terms of economy and politics. It is also the most populated city in France (12 million inhabitants). The city is crossed by the river Seine, which is the main river of the region, and the one in which most of the wastewater of Paris is discharged after treatment. Thus, in the context of the COVID-19 epidemic, a project to analyse wastewater appeared in order to find for traces of the virus. To carry out this task, a plan to found a scientific partnership project, aimed at pooling skills and frequently producing new data and analyses, was formulated. This plan was put together by the Obépine project, the Mocopée research programme, the LABOCEA laboratory, the PROSE unit, as well as the INRAE research institute and SIAAP. This initiative is reflected in an epidemiological follow-up of COVID-19 made by OBEPINE, after the collection of samples to evaluate the efficiency of the water treatment as well as that of the sludge. Finally, we can look for traces of the virus, to continue to observe the evolution of the epidemic.

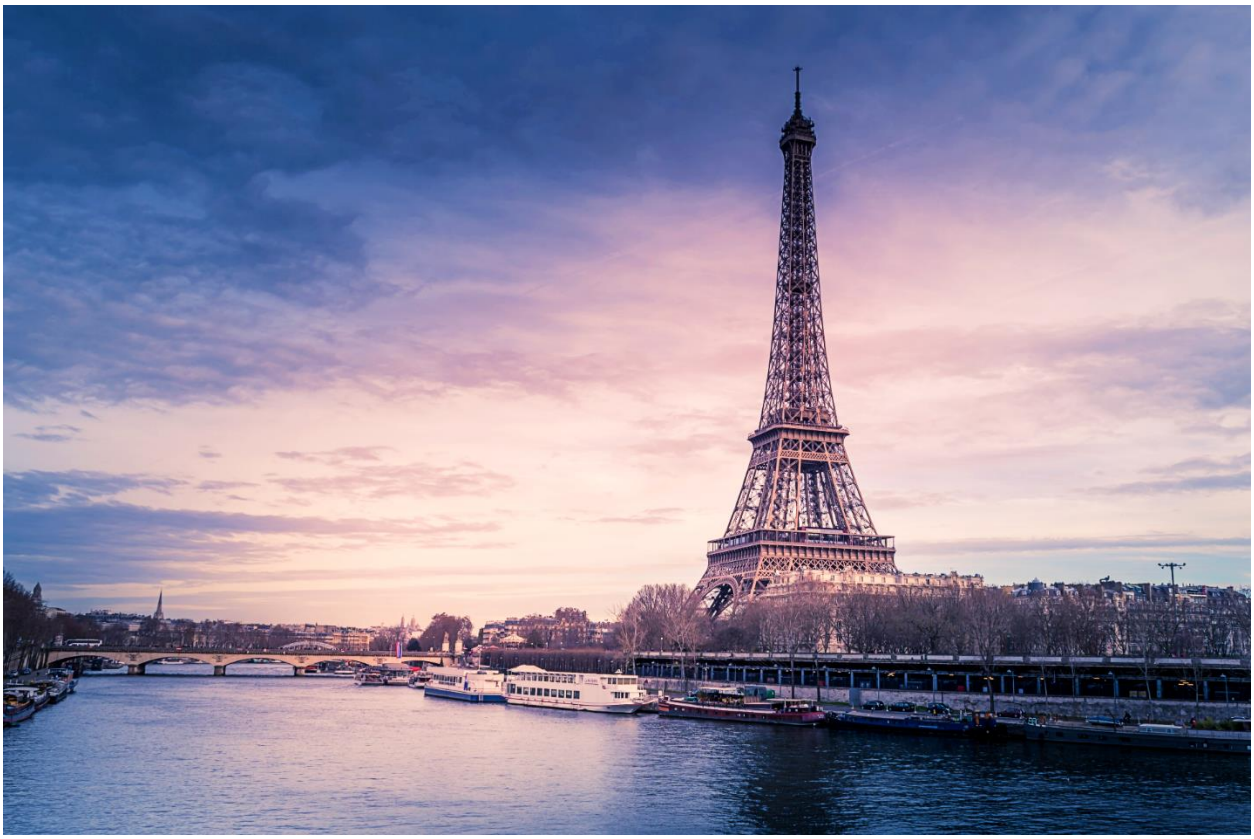


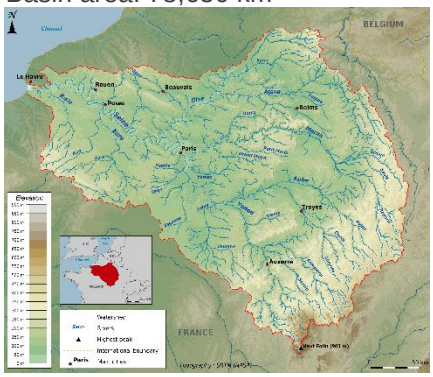
Image source: Chris Karidis on Unsplash

Problem: Viral outbreak and potential massive release of viral load into water with no monitoring established

Solution: Establishment of a scientific partnership project, aiming at improving knowledge on the virus, pooling of skills and frequent production of data and analysis to establish traceability and monitoring of the COVID-19 virus.

Geographic information

Country: France
City and population: Paris, 12 million
Basin name: Seine River basin
Basin area: 78,650 km²



Problem

SARS-COV 2 is a virus that is mainly transmitted through exposure to respiratory fluids carrying infectious virus. The main factor of infection remains the projection of micro-droplets by sneezing or coughing. The rapid infection of the population by COVID-19 in France in 2020 and 2021, and particularly in Paris, led to a restriction in movement of the population, as well as the need to monitor the epidemic's evolution within the city in a precise manner.

The lack of precise knowledge on how the virus was spread and moving through the population, forced decisions to be made with limited knowledge of both the viral target and the rate of infection. It was realised that availability of data on the detection of SARS-COV 2 in wastewater would be complementary to the

current epidemiological data and those from serological tests. It could also provide information on the effectiveness of treatment of wastewater and sludge.

What are the Drivers for Action?

For more information on the Drivers for Action visit the Action Agenda for Basin-Connected Cities

Extreme Events	Declining water quality	Water availability
☐Public health hazards	☐ High operating costs	☐ Water supply disruption
☐ Damage to infrastructure	☐ Loss of credibility and trust	☐ Constraints to growth
☐ Economic activities and supply chain disruption	☒ Environmental, cultural and health impacts	☒ Declining quality of life

Solution

The solution was divided into three parts:

In March 2020, the OBEPINE (Epidemiological Observatory of Wastewater// Observatoire Épidémiologique des Eaux Usées) was set-up, which not only serves to improve knowledge on COVID-19 and produce frequent data analysis but also applied a similar approach of monitoring and identification as with other viruses. Moreover, OBEPINE encouraged pooling of knowledge of different stakeholders including Mocopée research program, Laboratoire d'analyse en Bretagne (LABOCEA) laboratory, the Environmental biOtechnology PRoceSses (PROSE) unit, Institut national de la recherche agronomique (INRAE), and the Greater Paris Sanitation Authority known as Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP).

The second component was to improve the understanding of the fate of SARS-CoV2 in the sanitation system, by following the decay of the viral RNA and the viral load present in wastewater and sludge, and to evaluate control factors such as temperature. This study allowed the partnership to evaluate both the wastewater and sludge treatment processes.

Treatment of wastewater eliminated most of the viral load during the filtering process and confirmed the treatment quality. It was found that in the long term, by tracing samples in the wastewater (within the network and from collection points), it was possible to trace the dynamics of the epidemic with greater precision and eventually draw a map of the clusters in the city more easily. The OBERPINE network has now been replaced by a national organization “GIS Obepine”, the Scientific Interest Group of the OBservatoire ÉPIdémiologique daNs les Eaux usées to monitor COVID-19 in wastewater.

Finally, the third component was the post-treatment follow-up in the different Parisian rivers, using bio-concentration methods through organisms such as freshwater mussels which concentrated the viral RNA, otherwise detection would have been difficult because of the rapid decay rate of the virus.

Pathways for Action

For more information on the Pathways for Action visit the Action Agenda for Basin-Connected Cities

Assessment	Planning	Implementation
☒Investment in data & information systems	☐ Risk-based approach to planning	☐ Integration of natural infrastructure
☒ Linking traditional water management with science	☐ Water allocation mechanisms	☐ Economic and financing mechanisms
☐ Invest in values to motivate water decision-making	☐ Stakeholder participation in planning and management	☐ Building partnerships from catchment to tap
	☐ Aligning urban development with basin management	☒ Digital Technologies

Lessons learned

The research of the OBEPINE network involved analysis of wastewater from 150 wastewater treatment plants selected according to defined parameters (e.g., economic activity of the area surrounding it or its demography) and 7 laboratories, spread over France. In the Île-de-France region which includes Paris, SIAAP involved their wastewater treatment plants.

Several times a week, wastewater samples were collected from the treatment plants to be analysed in partner laboratories to assess the quantity of the Covid-19 genome. The results were then presented as an indicator integrating several factors such as population movement and whether wastewater had been diluted by rain.

Even prior to 100 cases of Covid-19 being diagnosed in the Paris region, OBEPINE scientists detected traces of the virus genome in the wastewater - a sign, according to experts, that the virus was already present in March 2020 in the Paris region. Early results of the Mocopée program have shown that wastewater treatment removes 99% of the Covid-19 genome.

Resources

https://www.reseau-obepine.fr/

About SIAAP

SIAAP- the greater Paris Sanitation Authority- was established in 1970. SIAAP is the public service utility that treats wastewater every day from 9 million inhabitants of Ile de France, including also storm

water and industrial wastewater. SIAAP, with more than 1,700 personnel, treats 7d / 7, 24H / 24, almost 2.5 million m^3 of water, transported by 440 km of main sewers and treated by its six waste water treatment plants. This has improved water quality in the Seine and the Marne Rivers.

About OBEPINE

The Obepine consortium was developed in April 2020 under the impetus of the Covid-19 Analysis, Research and Expertise (Care) Committee, which prompted the analysis of wastewater as an epidemiological surveillance tool to work together for a broader objective.

Today, the Obépine consortium (Epidemiological Observatory in Wastewater) brings together researchers in medical virology, environmental microbiology, applied mathematics, hydrology and infectiology with the ambition to monitor the health status of populations through the analysis of wastewater. The research activity of the Obépine consortium has made it possible to propose, since January 2021, a wastewater indicator based on the analysis of samples taken from a network of some 200 wastewater treatment plants (WWTPs) in metropolitan and overseas France.