



# Geospatial world forum

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## Geography for Health Early Warning Systems



# Agenda

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Team Panel

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Introduction

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Wastewater

4

Geospatial Intelligence



# 1. Team Panel



Mathilde Molendijk  
Henk Scholten



## 2. Introduction



# Introduction

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- **Accurate and detailed** data are essential to understand the pandemic and to guide policies.<sup>1</sup>
- One of the ways to monitor the spread of the coronavirus SARS-CoV-2 and other diseases, is by measuring the number of **virus pathogens in sewages**.
- Wastewater-based surveillance is a promising approach **for proactive outbreak monitoring**. SARS-CoV-2 infects a large part of the population, which is often asymptomatic. Wastewater becomes an ideal system that detects even these cases<sup>2</sup>.
- With **1.7bn passengers** worldwide<sup>3</sup>, **air transportation can accelerate global outbreaks** (especially airborne transmission viruses) and it is clear that the travel and tourism industry has a role to play in **preventing** such events<sup>4</sup>

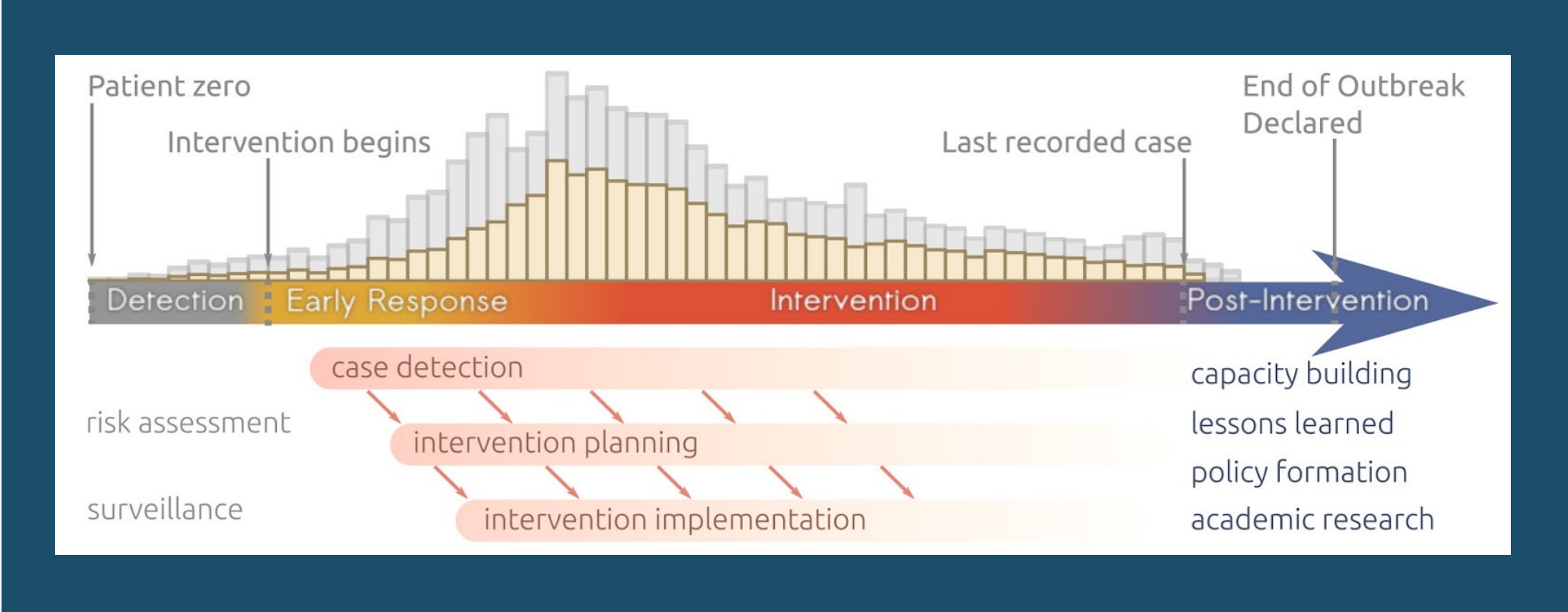
[1] Trias-Llimós, Sergi, et al. "The need for detailed COVID-19 data in Spain." *The Lancet Public Health* 5.11 (2020): e576.

[2] Wu, Fuqing, et al. "SARS-CoV-2 titers in wastewater are higher than expected from clinically confirmed cases." *Msystems* 5.4 (2020): e00614-20.

[3] Coronavirus: impact on the aviation industry worldwide - statistics & facts (<https://www.statista.com/topics/6178/coronavirus-impact-on-the-aviation-industry-worldwide/>)

[4] Sun, Xiaoqian, et al. "COVID-19 pandemic and air transportation: Successfully navigating the paper hurricane." *Journal of Air Transport Management* (2021): 102062.

# Introduction



Polonsky, Jonathan A., et al. "Outbreak analytics: a developing data science for informing the response to emerging pathogens." *Philosophical Transactions of the Royal Society B* 374.1776 (2019): 20180276.

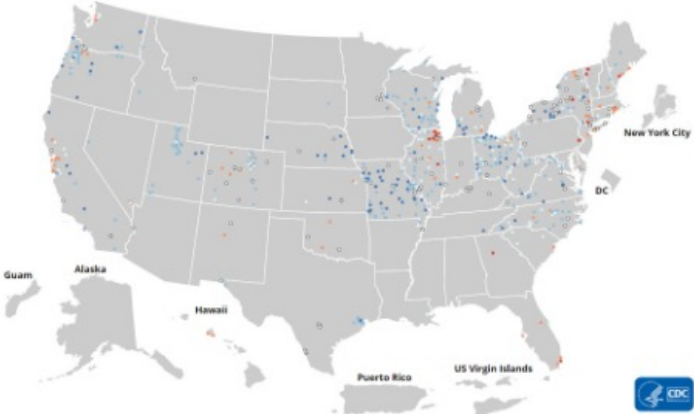
# Introduction

## Wastewater Surveillance

In February 2022, CDC's COVID Data Tracker released a Wastewater Surveillance tab, which tracks levels, changes, and detections of SARS-CoV-2 viral RNA in wastewater at more than 800 testing sites across the country. Because many people with COVID-19 shed the virus in their feces, wastewater testing can help us monitor COVID-19 in communities. Wastewater surveillance can provide an early warning of increasing COVID-19 cases and help communities prepare.

Currently, virus levels in wastewater are relatively low across the country. However, more than half of all sites reporting wastewater data are experiencing a modest increase in SARS-CoV-2 levels. These increases often reflect minor changes from very low levels to levels that are still low. It's important to note that even a small increase when levels are low can appear like a dramatic increase in the percent change. For more information on how to use wastewater data, visit [CDC's website](https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html).

SARS-CoV-2 Levels in Wastewater by Site



[View Larger](#)

0% means levels are the lowest they have been at the site; 100% means levels are the highest they have been at the site.

○ New site ● 0% to 19% ● 20% to 39% ● 40% to 59% ● 60% to 79% ● 80% to 100%

[More Wastewater Data](#)

<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>



## 3. Wastewater





# Wastewater Management – Use Case

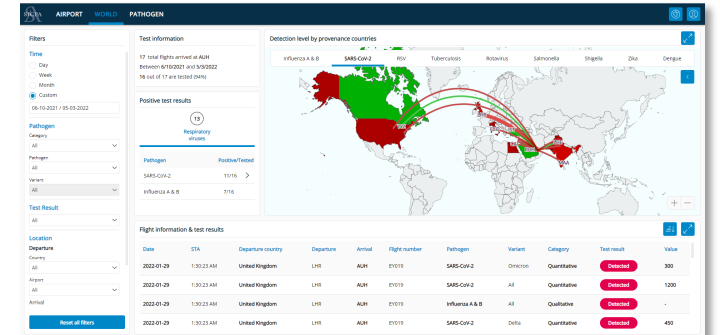
Process Testing & Platform Visualization

1. COLLECTION

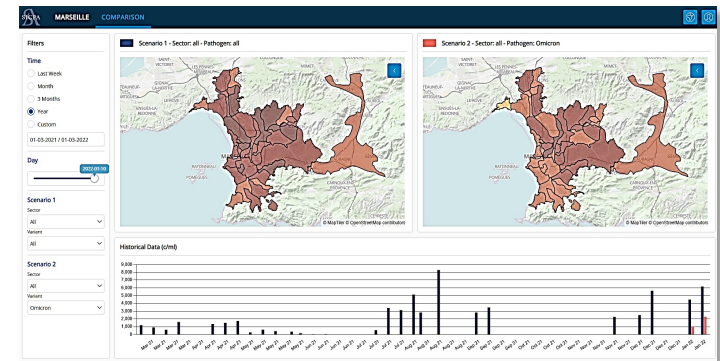
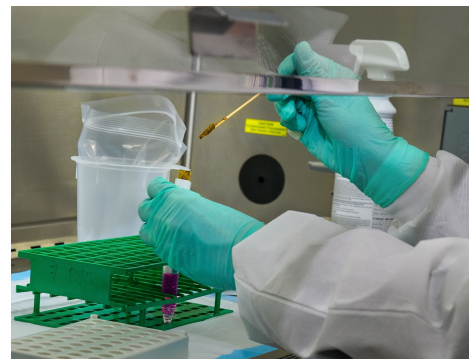
2. SAMPLE ANALYSIS & SCREENING

3. REAL-TIME RESULT PUBLICATION

## Mobility Use Case



## Community Use Case





## 4. Geospatial Intelligence

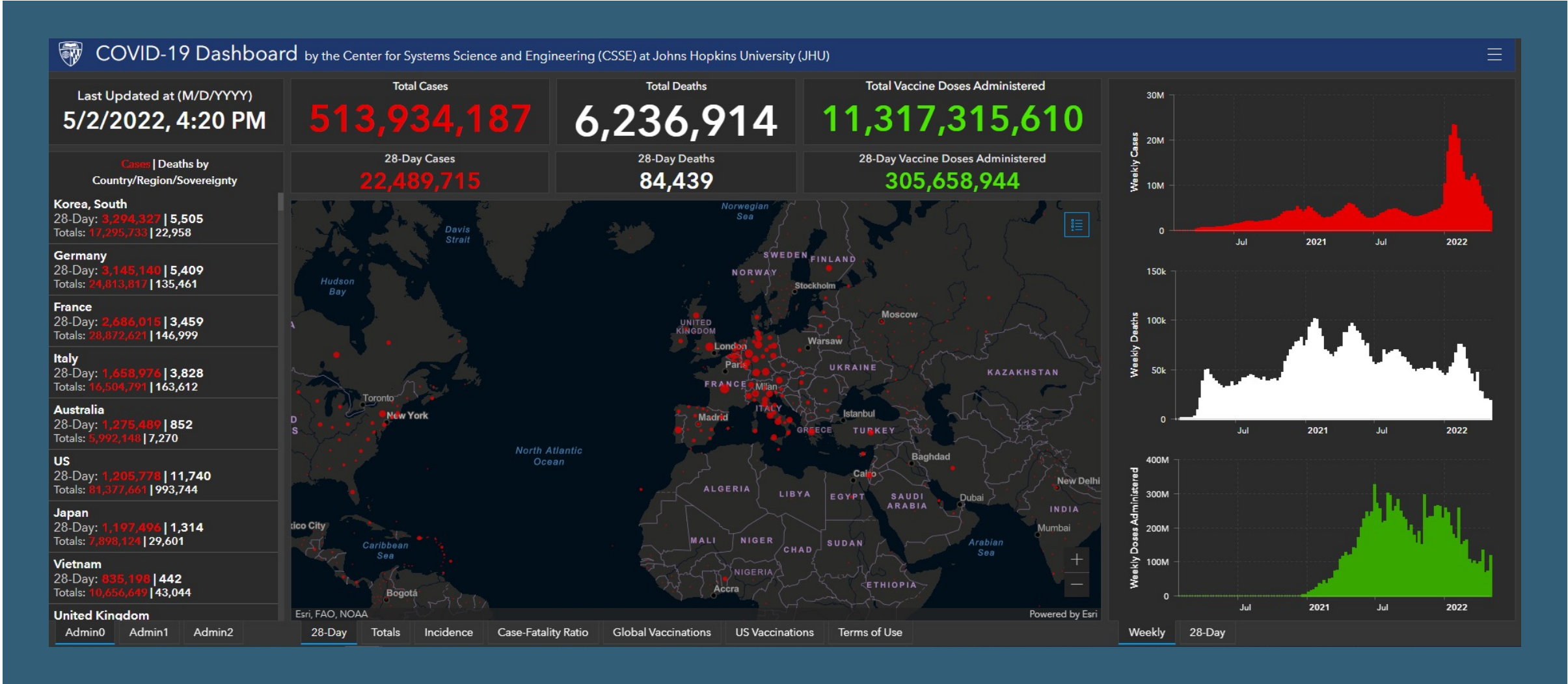


# What is the role of geography in Health?

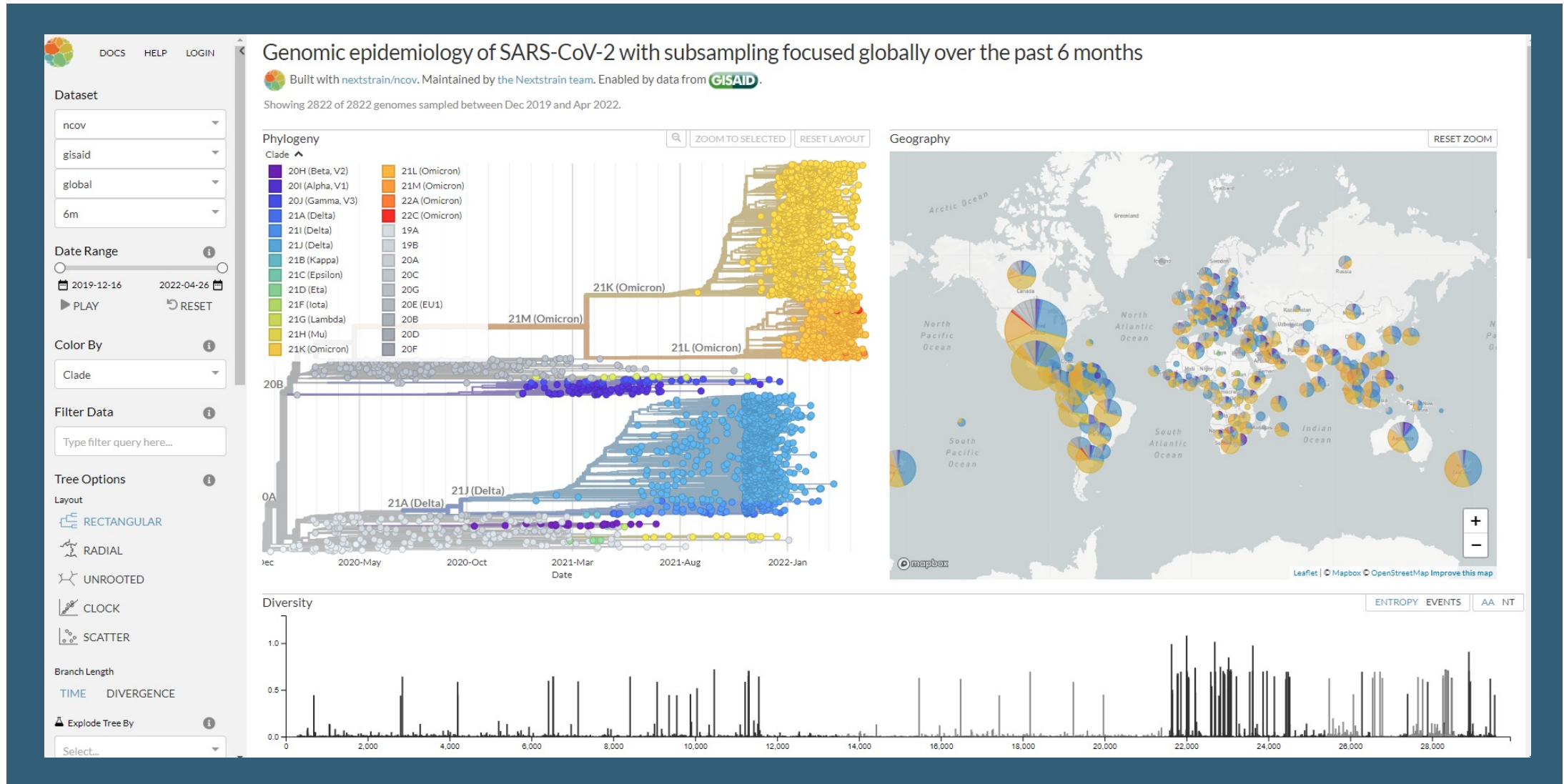
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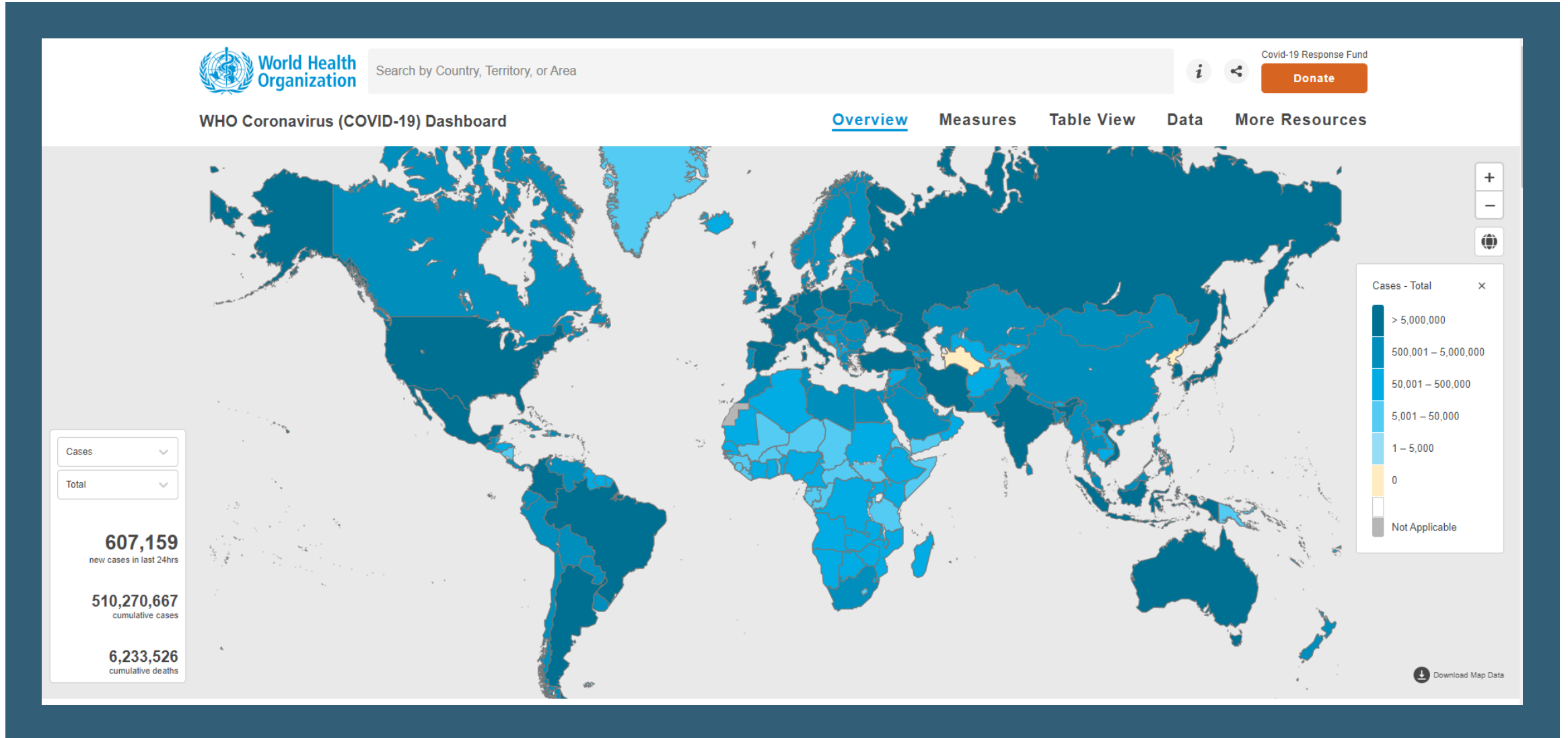
# GIS for healthcare: a case study

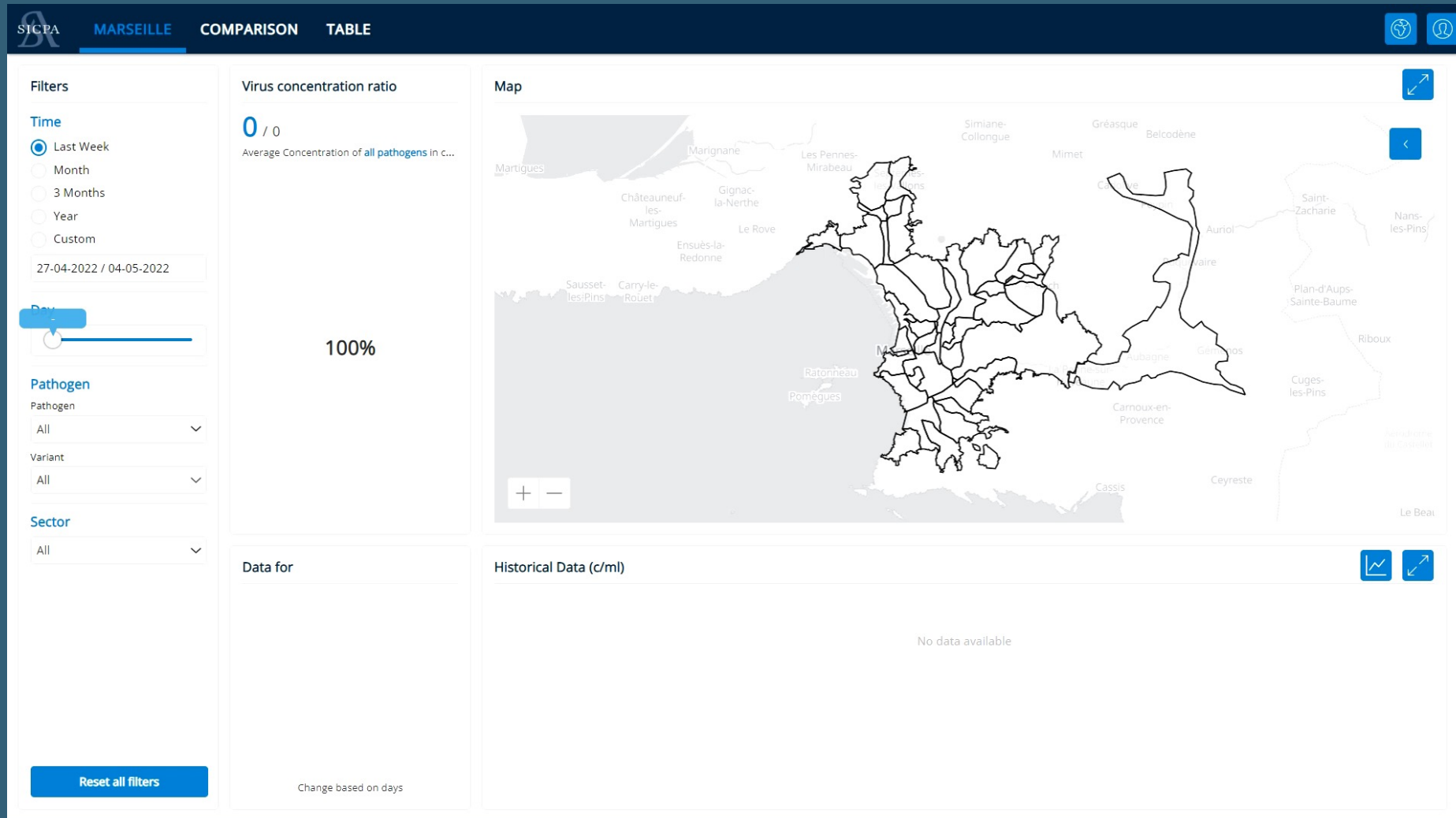


# GIS for healthcare: a case study



# GIS for healthcare: a case study





# GIS for healthcare

## Airport

The screenshot displays a web-based GIS application interface. At the top, a navigation bar contains the SICPA logo and tabs for 'AIRPORT', 'WORLD', and 'PATHOGEN'. The 'WORLD' tab is active. The interface is divided into several sections:

- Filters (Left Sidebar):** Includes sections for 'Time' (Day, Week, Month, Custom), 'Pathogen' (Category, Pathogen, Variant), 'Test Result', and 'Location' (Departure Country, Airport, Arrival Country, Airport). A 'Reset all filters' button is at the bottom.
- Test information (Top Middle):** Shows '0 total flights arrived at OMAA' and '0 out of 0 are tested (0%)'.
- Detection level by provenance countries (Map):** A world map showing detection levels for various pathogens. The 'SARS-CoV-2' pathogen is selected. A legend indicates detection levels: No Data (grey), None (green), Low (yellow), Medium (orange), High (red), and Extreme (dark red).
- Flight information & test results (Bottom):** A table with columns: Date, STA, Departure country, Departure, Arrival, Flight number, Pathogen, Variant, Category, Test result, and Value. The table is currently empty, showing '1 / 1' results.





# Digital Twin of the whole of the Netherlands

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GeodanMaps  
6481 40233

Thema

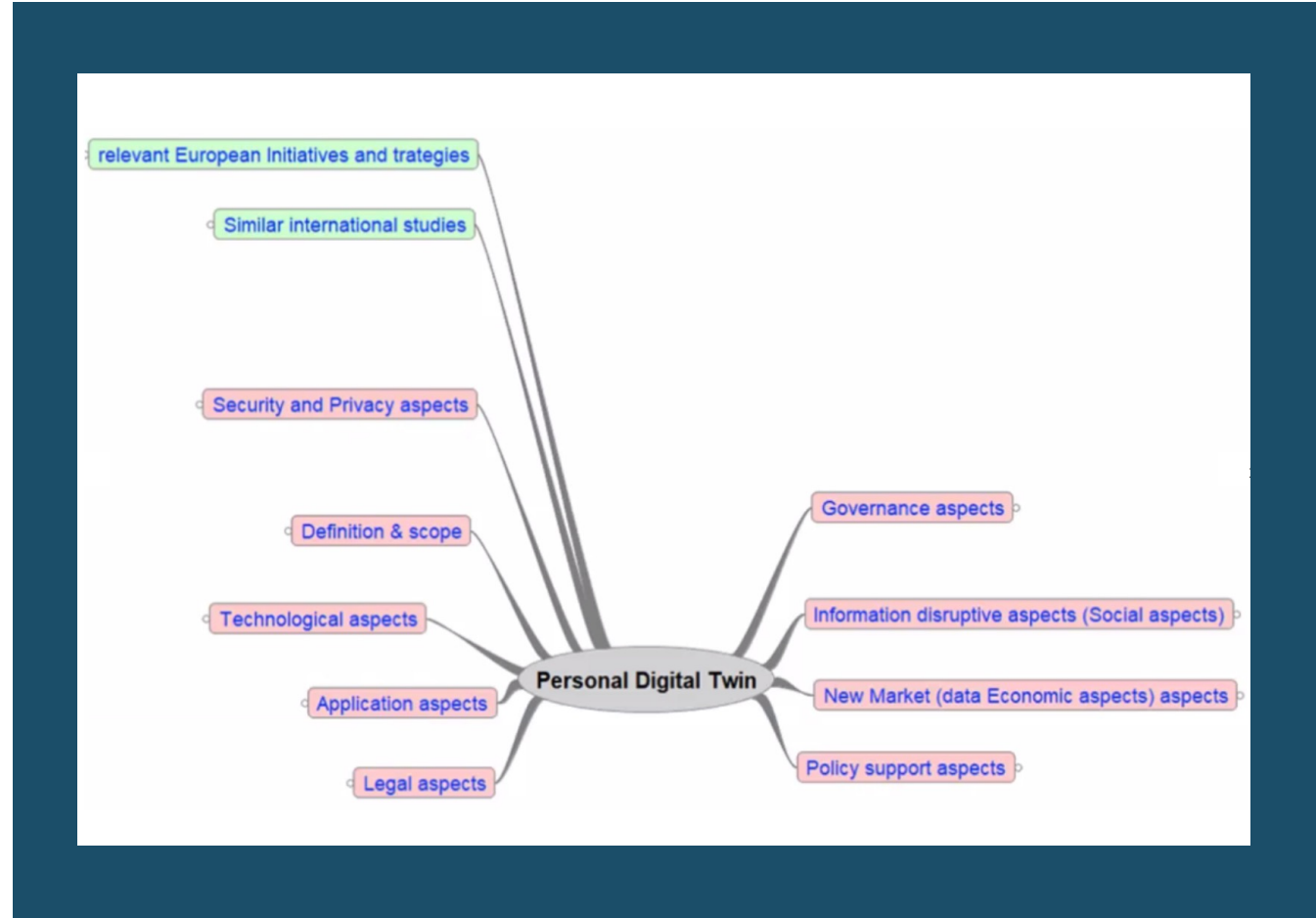
- Geen
- EnergieLabel
- Bouwjaar

Legend for EnergieLabel:

- a++++
- a+++
- a++
- a+
- a
- b
- c
- d
- e
- f
- S

# Digital Twin Infrastructure

## Personal Digital Twin

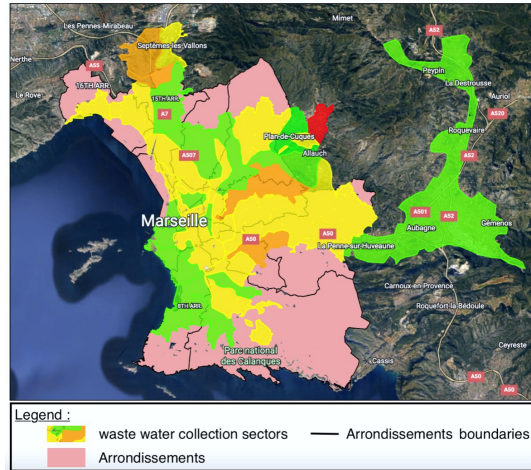


<https://cmte.ieee.org/futuredirections/tao/eu-itc/>  
<https://venturebeat.com/2021/07/04/21-ways-medical-digital-twins-will-transform-healthcare/>

# Digital Twin: From Monitoring towards Predictions/Simulations

## Use case of Marseille wastewaters

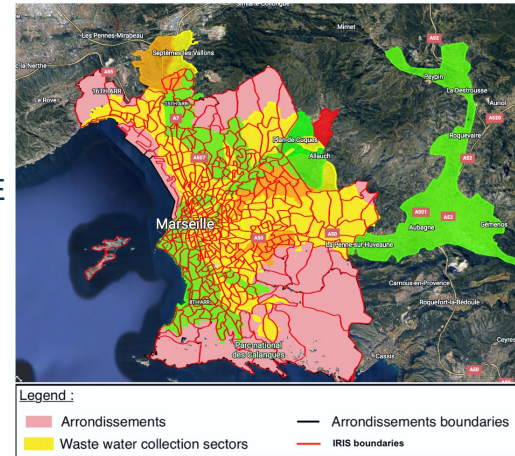
Geographical divisions of the sectors



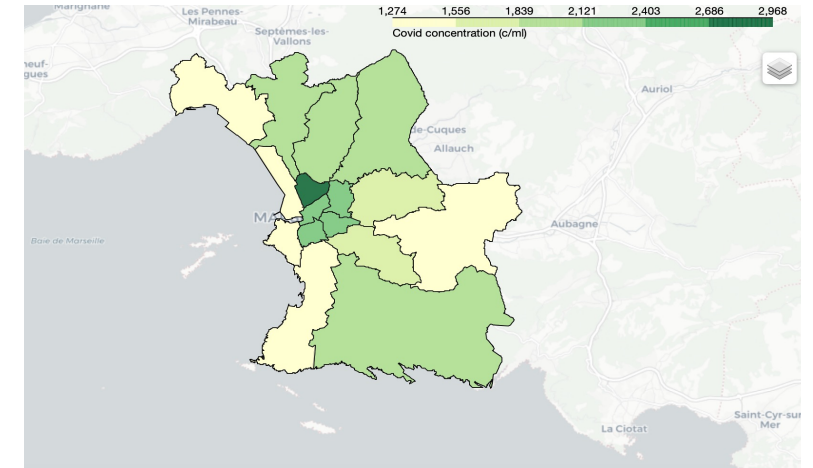
DISCRETIZE



Map enriched with the IRIS



COMBINE

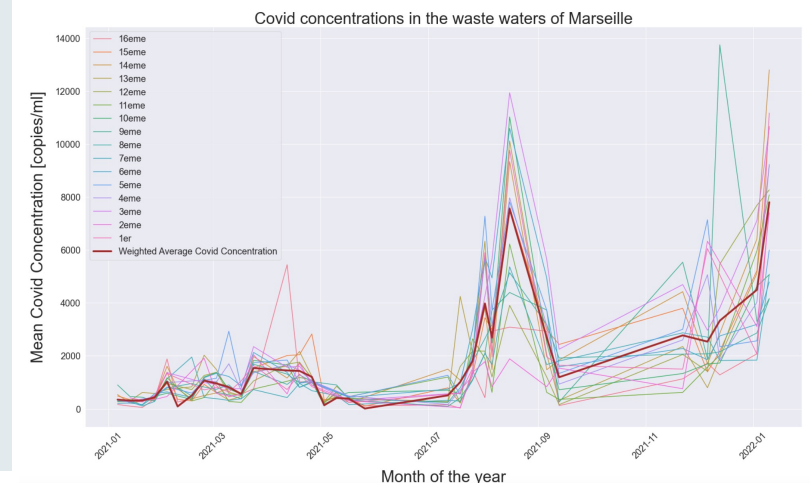


RESULT



## Combining data from different geographical areas

- Covid-19 concentrations were measured at sewage treatment plants.
- Concentration data had to be reprocessed in order to be available for the administrative sectors.
- Decision making and elaboration of the dataset facilitation.





Thank you  
for your attention

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