Pancyprian wastewater surveillance system for SARS-CoV-2: the Cyprus Dashboard

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March 15th, 2022, EU4S 7th Town Hall meeting

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Pancyprian sUrveilLance of SARS-CoV-2 in urban wastEwater

Systematically monitoring of urban wastewater in Cyprus for the presence of selected RNA genetic markers of the SARS-CoV-2 virus and its variants, to better understand the dynamics and spatiotemporal trends of the COVID-19 pandemic.

Partners:

University of Cyprus
Nireas – International Water Research Center
Dr. D. Fatta-Kassinos, Dr. G. Nikolopoulos, Dr. P. Karaolia, I. Iakovides, P. Loutsiou, A. Violaris

KIOS Research and Innovation Center of Excellence
Dr. M. Polykarpou, Dr. D. Eliades, P. Pavlou, M. Kyriakou

The Cyprus Institute of Neurology and Genetics (CING)
Molecular Virology Department - Dr. C. Christodoulou, Dr. I. Richter

Water Development Department
Wastewater and Reuse Division - A. Larcou-Yiannakou, S. G. Michael

Medical and Health Services
Director - Dr. O. Kalakouta

Funding:
- Water Development Department, Ministry of Agriculture, Rural Development and the Environment
- Medical and Health Services, Ministry of Health

Republic of Cyprus

Co-Funding:
- European Commission Recommendation 2021/472

Objectives

1. Determination of the SARS-CoV-2 genetic fragments in urban wastewater
2. Epidemiological analysis of SARS-CoV-2 concentrations in urban wastewater
3. Identification of SARS-CoV-2 variants
4. Development of the SARS-CoV-2 monitoring platform (Dashboard)

Population coverage: ~70%

Objectives

- **Determination of the SARS-CoV-2 genetic fragments in urban wastewater**

Sampling:

Composite, 24-hour samples are collected from UWWTPs every Thursday and Monday (2 per week) and stored at 4 ˚C until analysis.

Centrifugation:

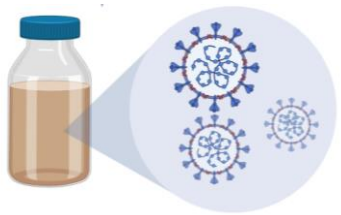
Centrifugation of samples followed by their pre-concentration to a smaller volume (filtration by specialized filters)

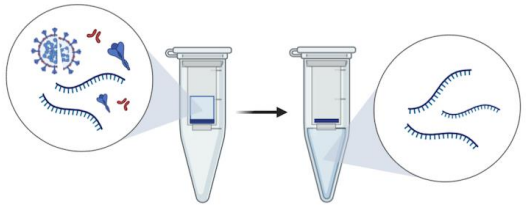
RNA extraction:

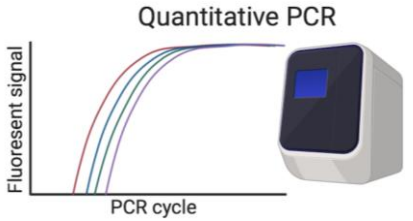
RNA is extracted from the pre-concentrated samples using RNA extraction kit (breaking of the viral cell membranes and release viral RNA).

Reverse Transcription PCR:

Genetic markers N2 and E are analysed using RT-qPCR for the quantification of their concentrations in the prepared samples.



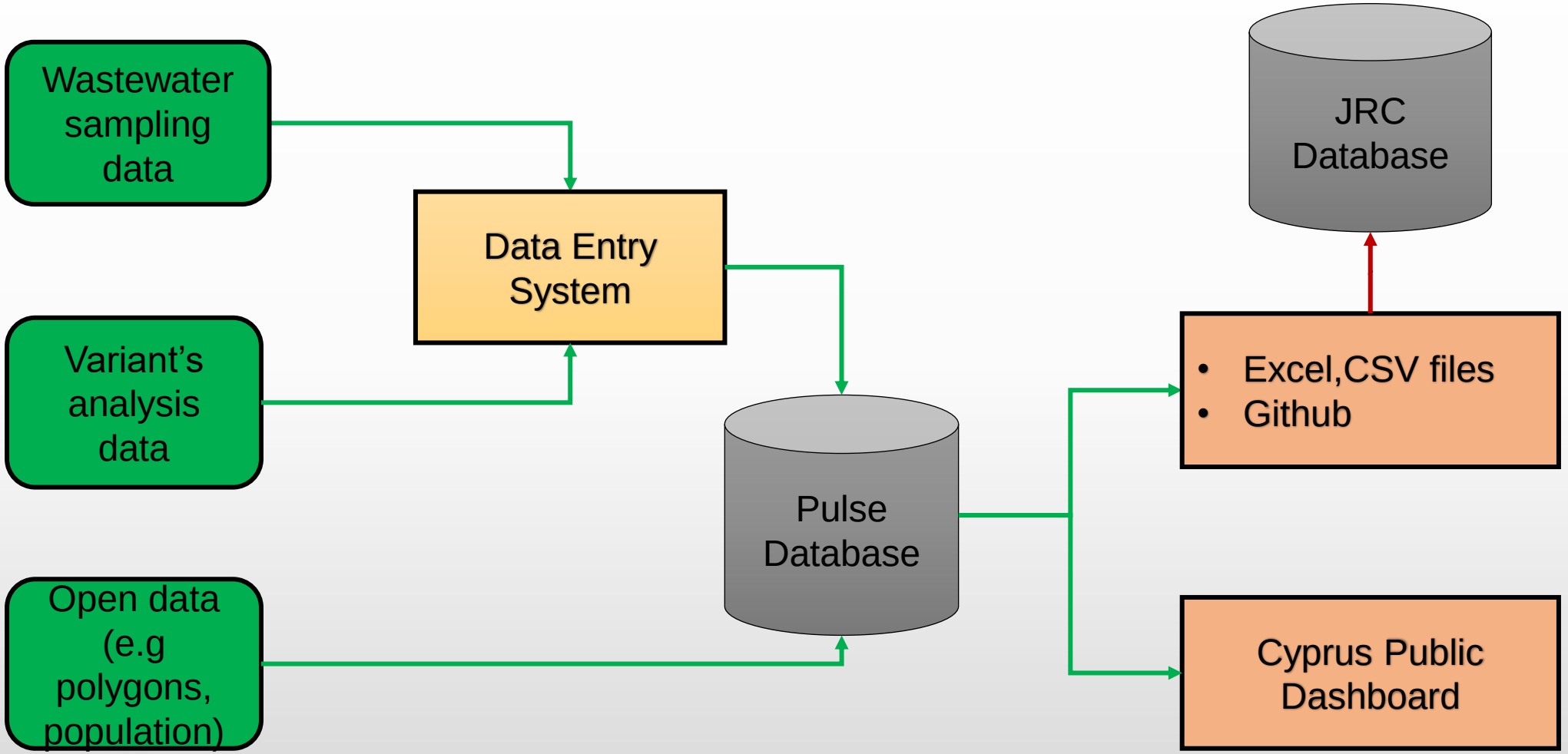




- **Epidemiological analysis of SARS-CoV-2 concentrations in urban wastewater**
  - Statistical analysis of the SARS-CoV-2 concentrations in wastewater
  - Correlations with the clinical epidemiological data obtained by the respective area served by each UWWTP

- **Identification of SARS-CoV-2 variants**
  - Two (2) inlet samples of urban wastewater from each UWWTP per month (14 samples per month in total) are being analyzed with the use of Next Generation Sequencing (MiSeq system) followed by bioinformatics analysis.

PULSE Data Analytics Platform Architecture

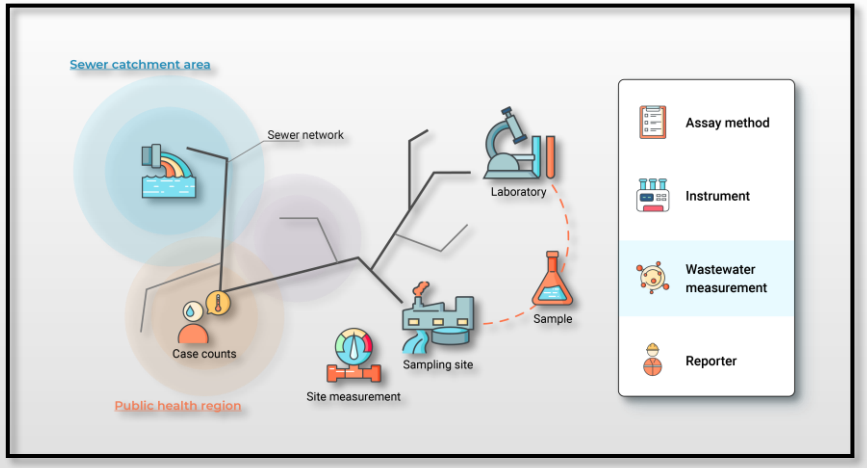


Data Templates

- Followed the Open Data Model (ODM) data templates (https://github.com/Big-Life-Lab/PHES-ODM)

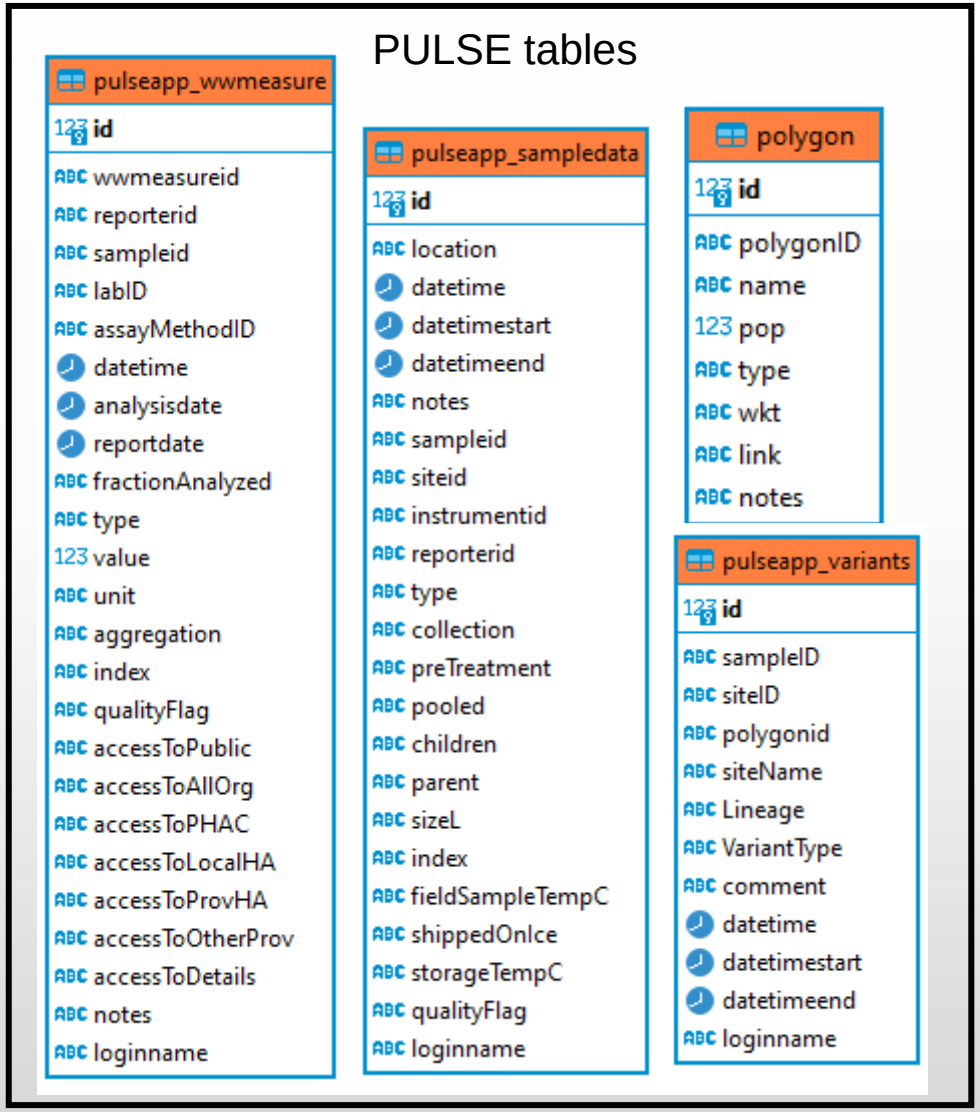
Variables of concern:

1. Sample
2. Wastewater Measurement
3. Site
4. Site Measurement
5. Reporter
6. Lab
7. Assay Method
8. Instrument
9. Polygon (region)
10. Covid - Public Health Data



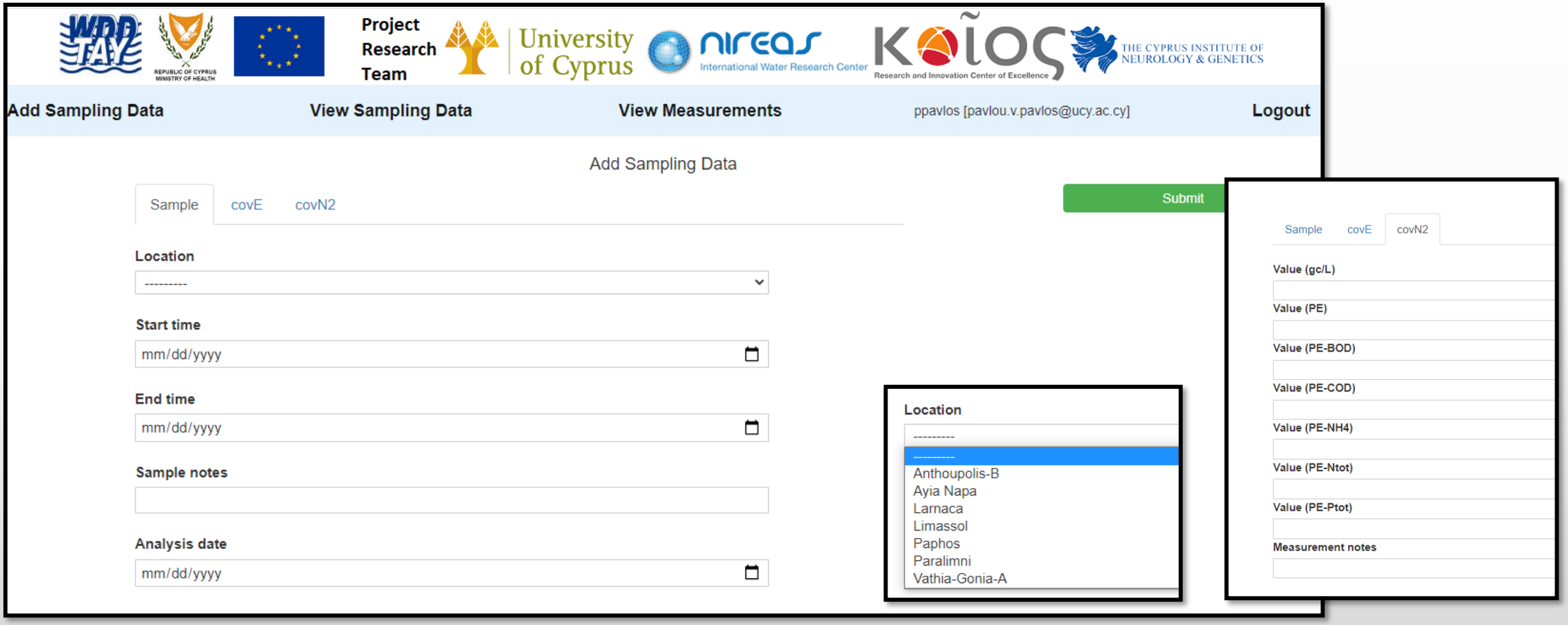
Nicolaï N., Therrien J.-D., Maere. T, Pileggi V., Swerdfeger H., Vanrolleghem P.A., Manuel D. (2021) Open Data Model for collecting, quality-ensuring and sharing of SARS-CoV-2 data and metadata, EU4S Sewage Sentinel System for SARS CoV-2 - 5th Town Hall Meeting, e-poster, https://api.ltb.io/show/ABCWX

PULSE tables



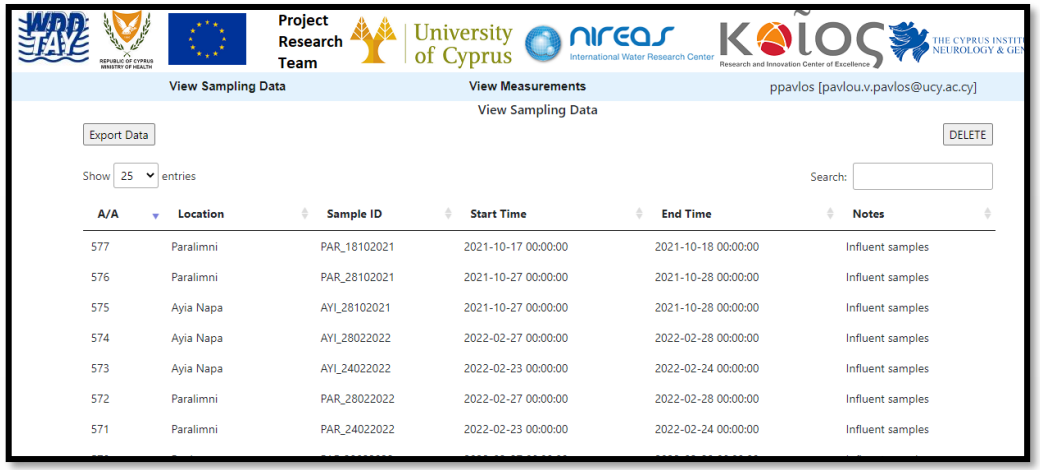
Data Analytics Platform

- A user-friendly interface for the laboratory personnel

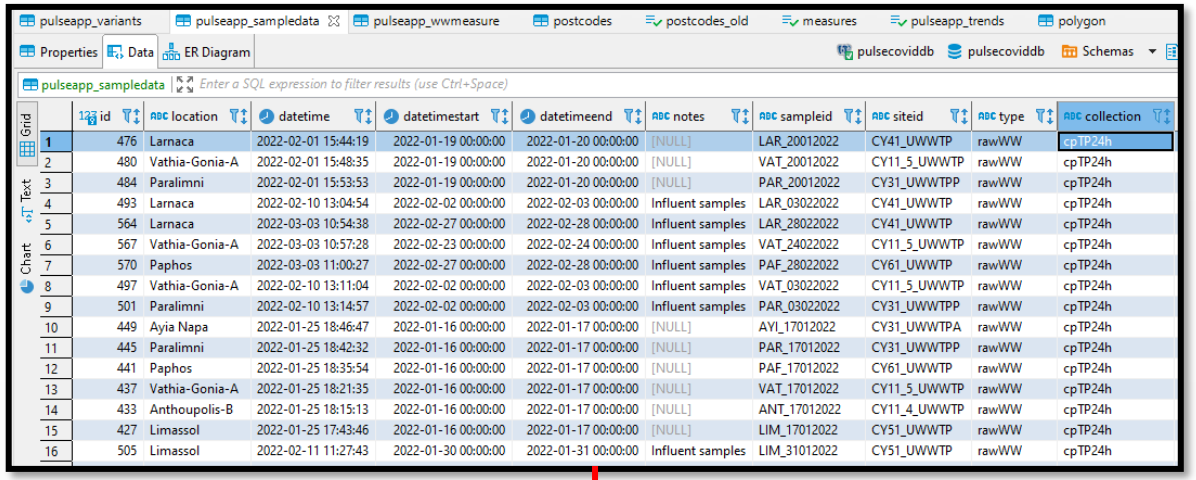


Data Analytics Platform

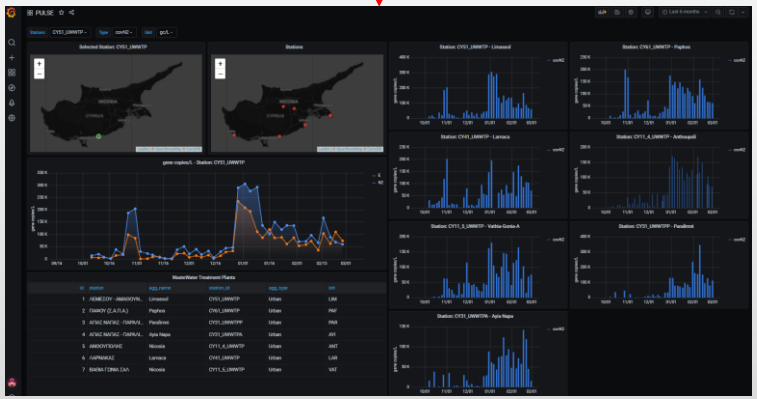
Data entry system



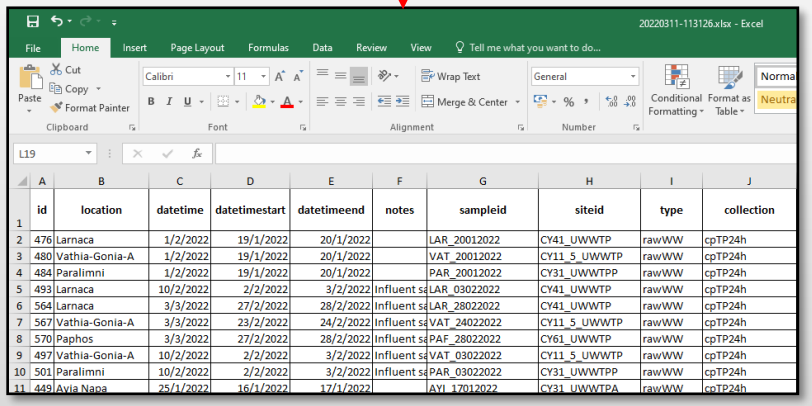
PostgreSQL database



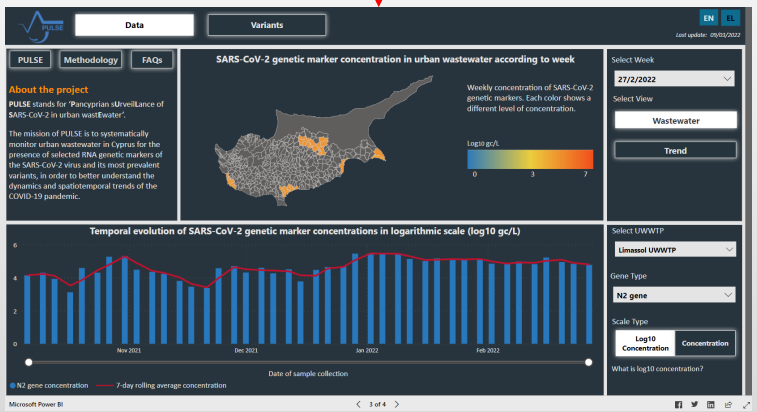
Internal Dashboard



Excel,CSV files



Public dashboard



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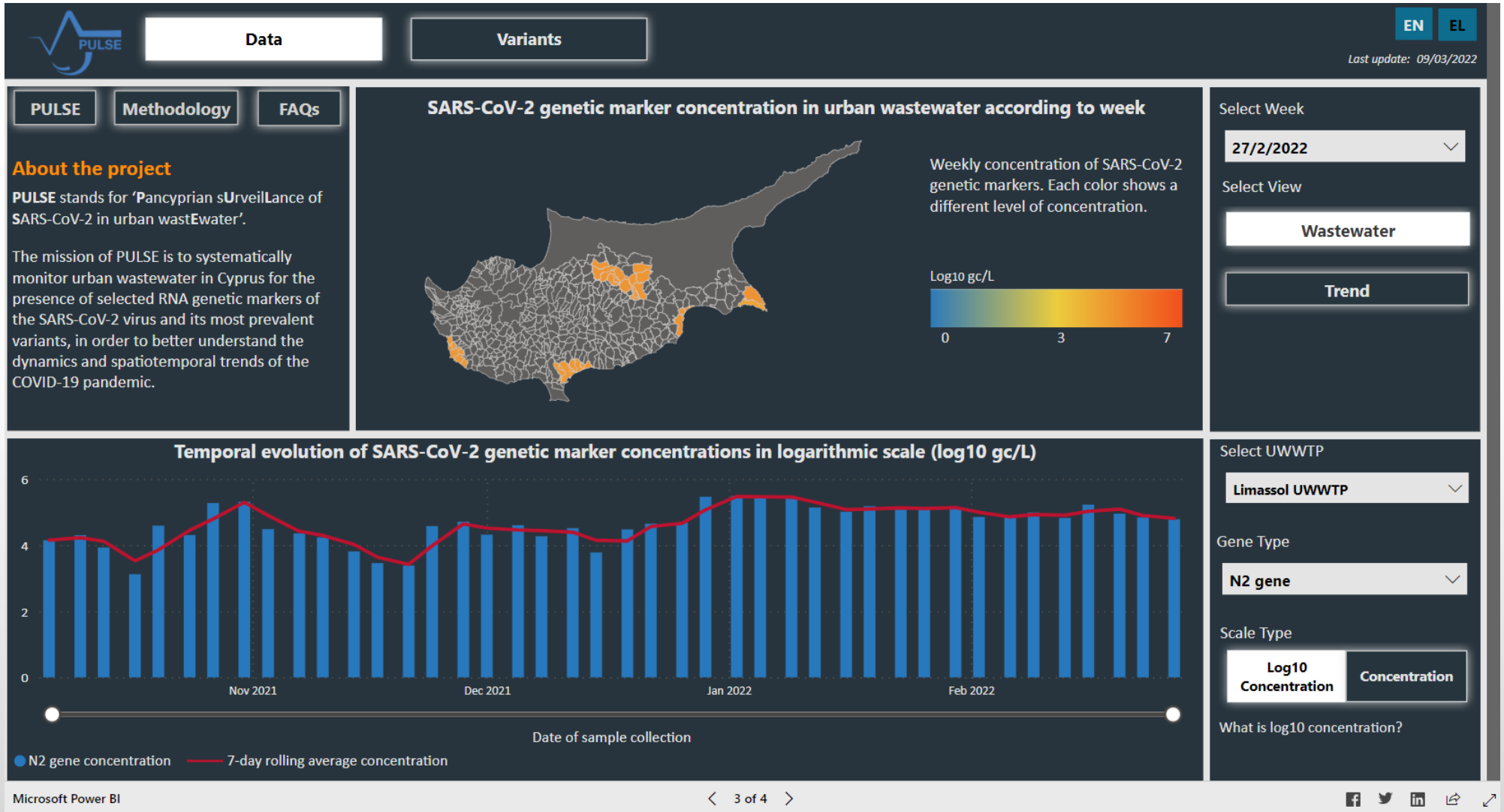
Public dashboard - Wastewater

https://covid-pulse.cy/



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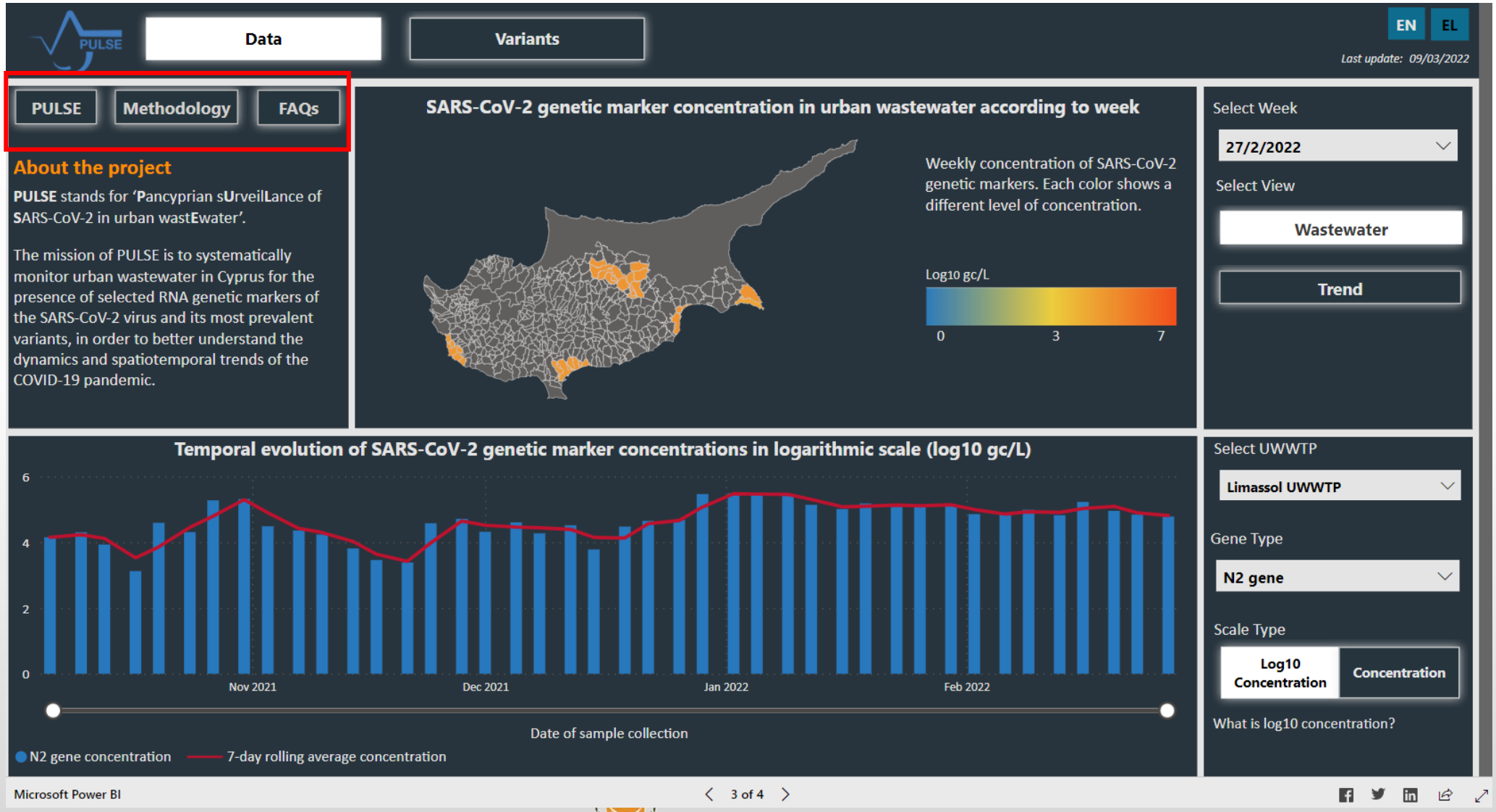
Public dashboard - Information



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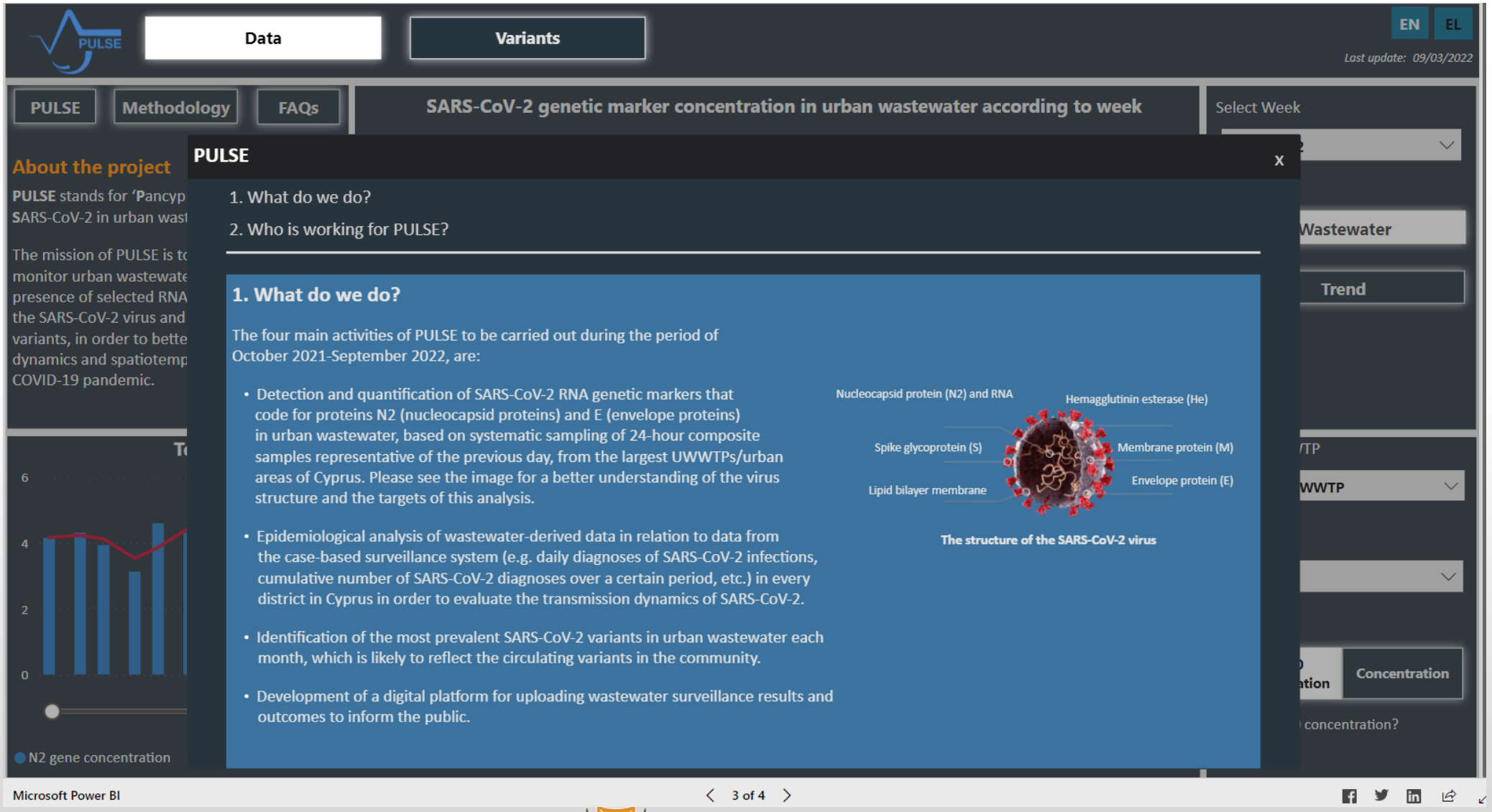
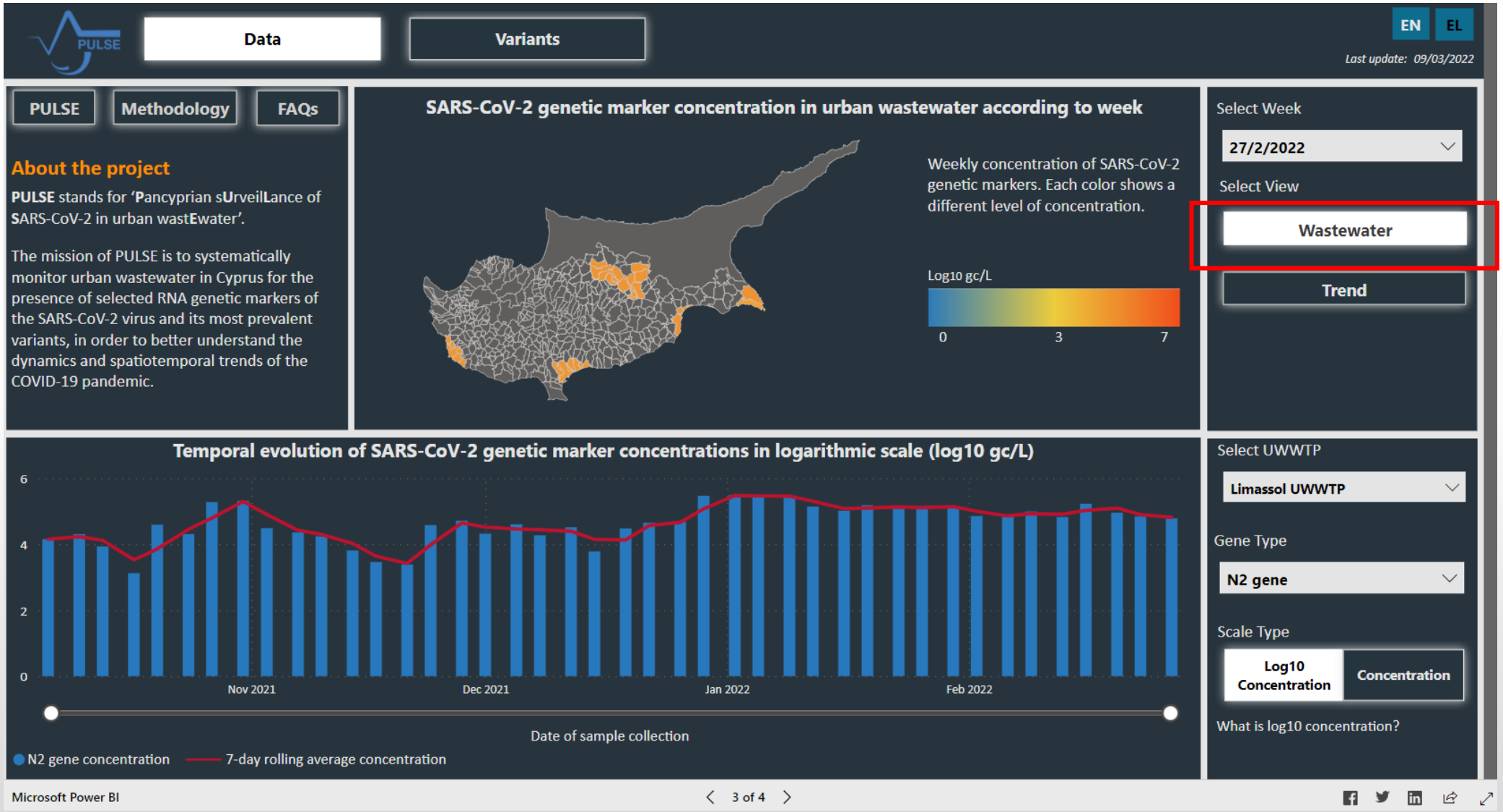


Public dashboard – Wastewater Map



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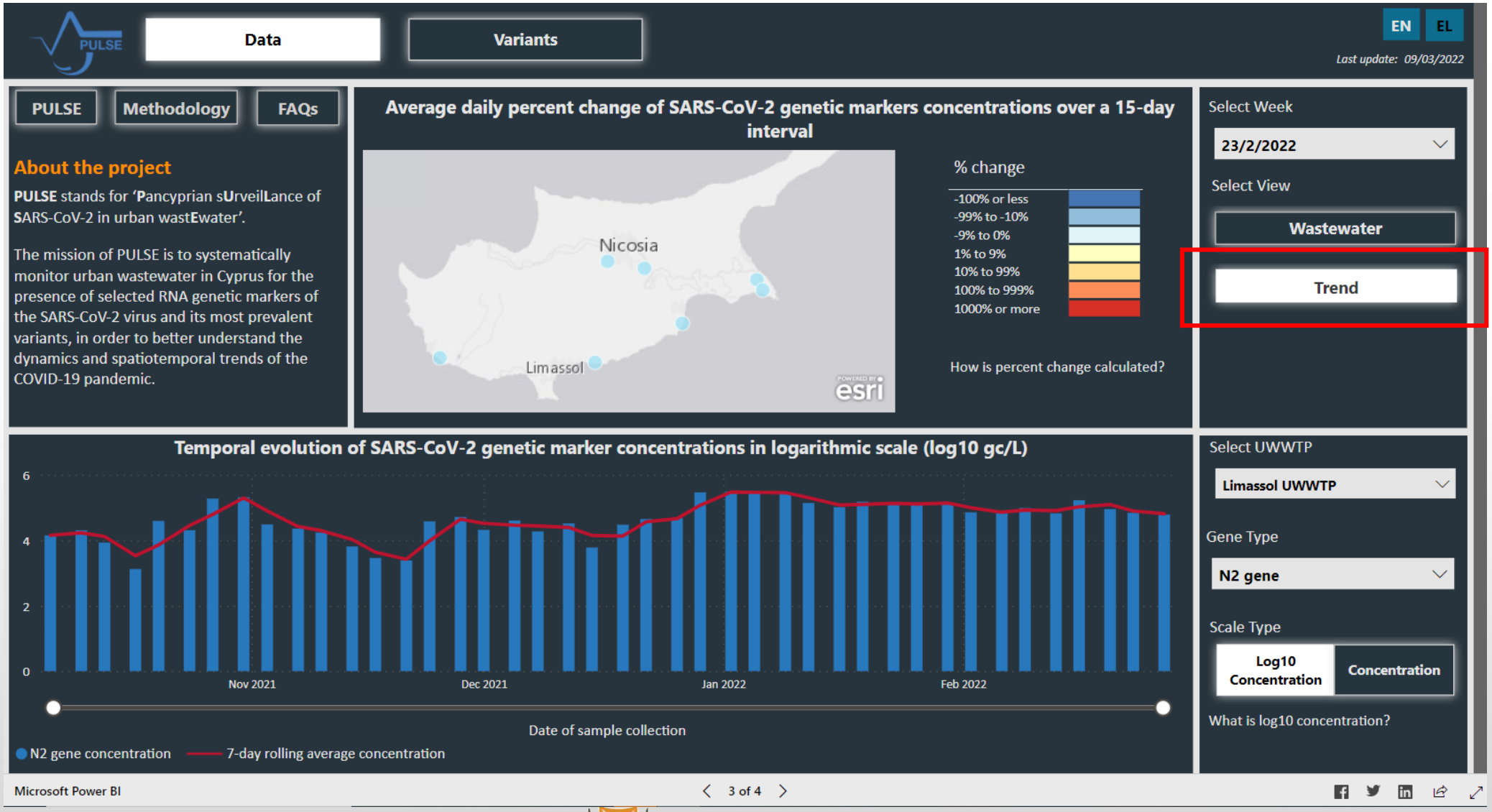
Public dashboard – Trend Map



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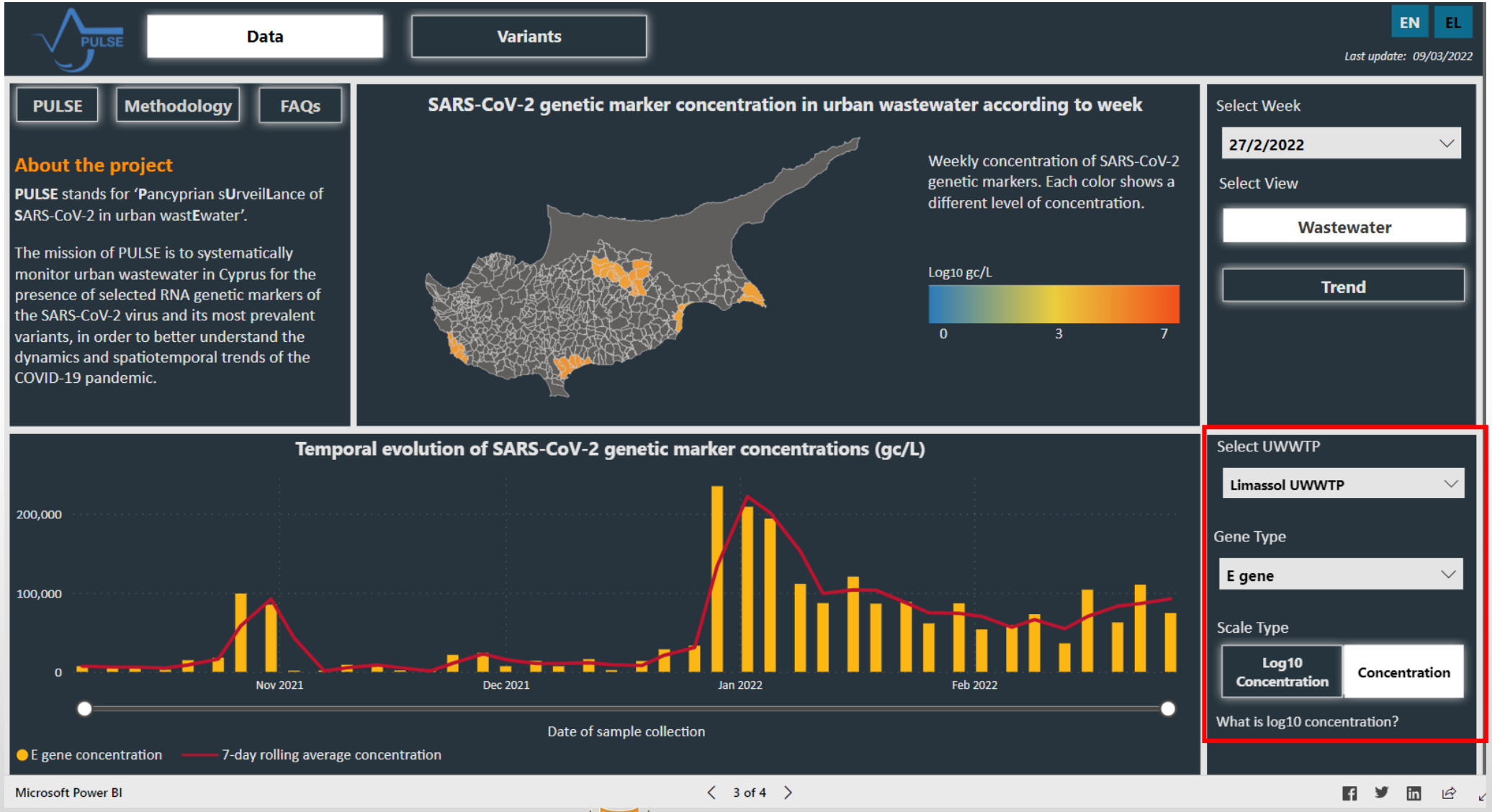
Public dashboard – Timeseries



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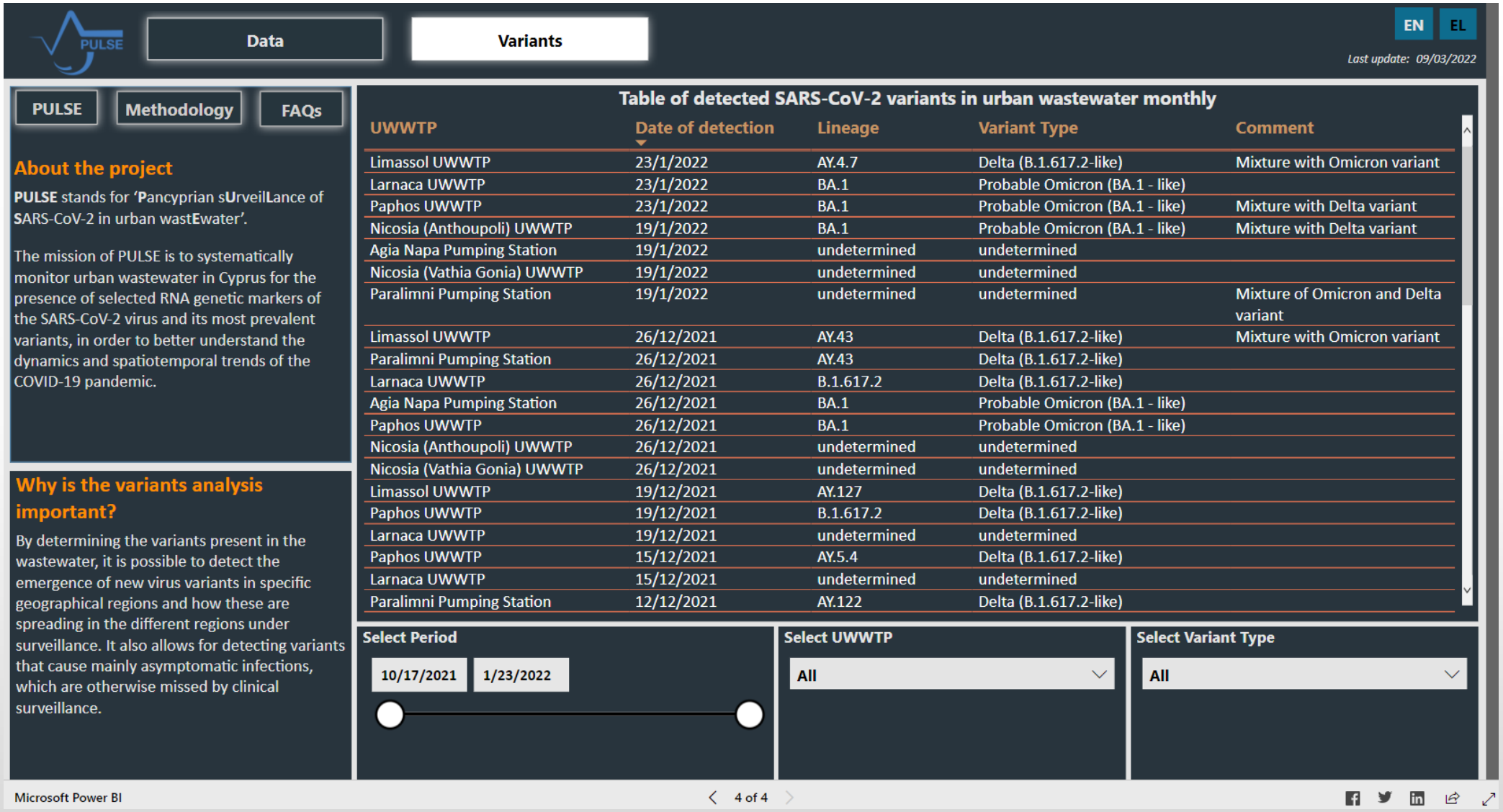
Public dashboard – Variants



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