Digital Water City

In situ measurement system of faecal indicator bacteria

Machine learning based Early Warning System for bathing water quality

Mobile application to communicate bathing water quality with citizens

digital-water.city
digitalwater_eu

digital-water.city has received funding from the European Union's H2020 Research and Innovation Programme under Grant Agreement No. 820954.

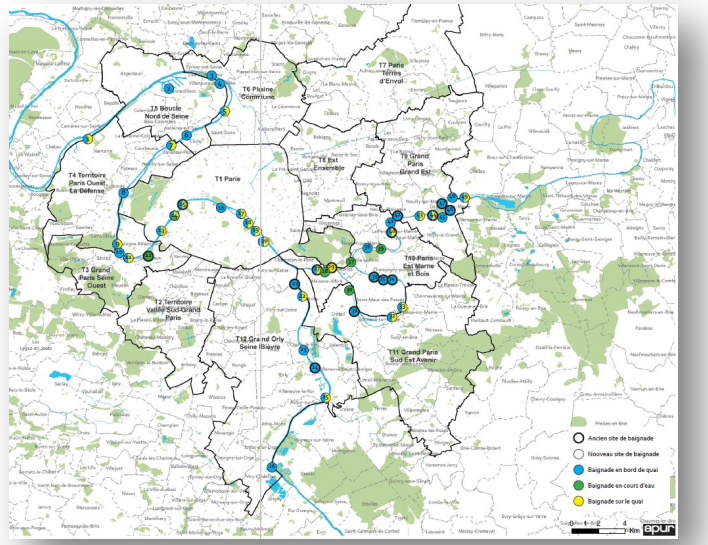
Digital Water City – Paris area

Early Warning System

Prediction tool + **Mobile Applications**

Olympic and Paralympic games of 2024

Legacy : Safe and sustainable urban river bathing



Developments axis

- Modelling of the bathing water quality (PhD P. Dupain)
- Prediction tool of the bathing water quality
- Sociological issues linked to the dissemination of the water quality
- Measurement system (ALERT) of Fecal Indicator Bacteria (E. coli and intestinal enterococci)

The deliverables

Measurement tool ALERT

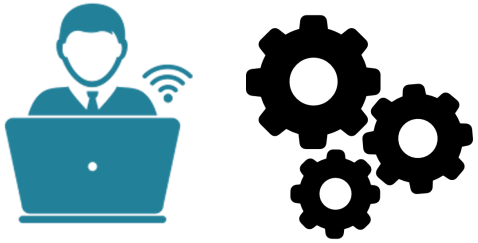
fluidion
fluidic intelligence

Prediction tool

SIAAP
Service public de l'assainissement francilien

SORBONNE UNIVERSITÉ

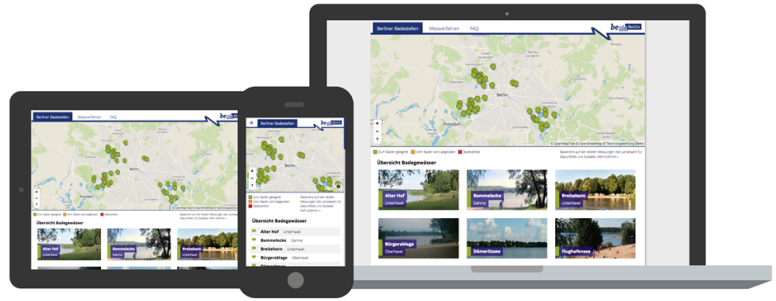
KOMPETENZZENTRUM WasserBerlin



« Expert » App « Public » App

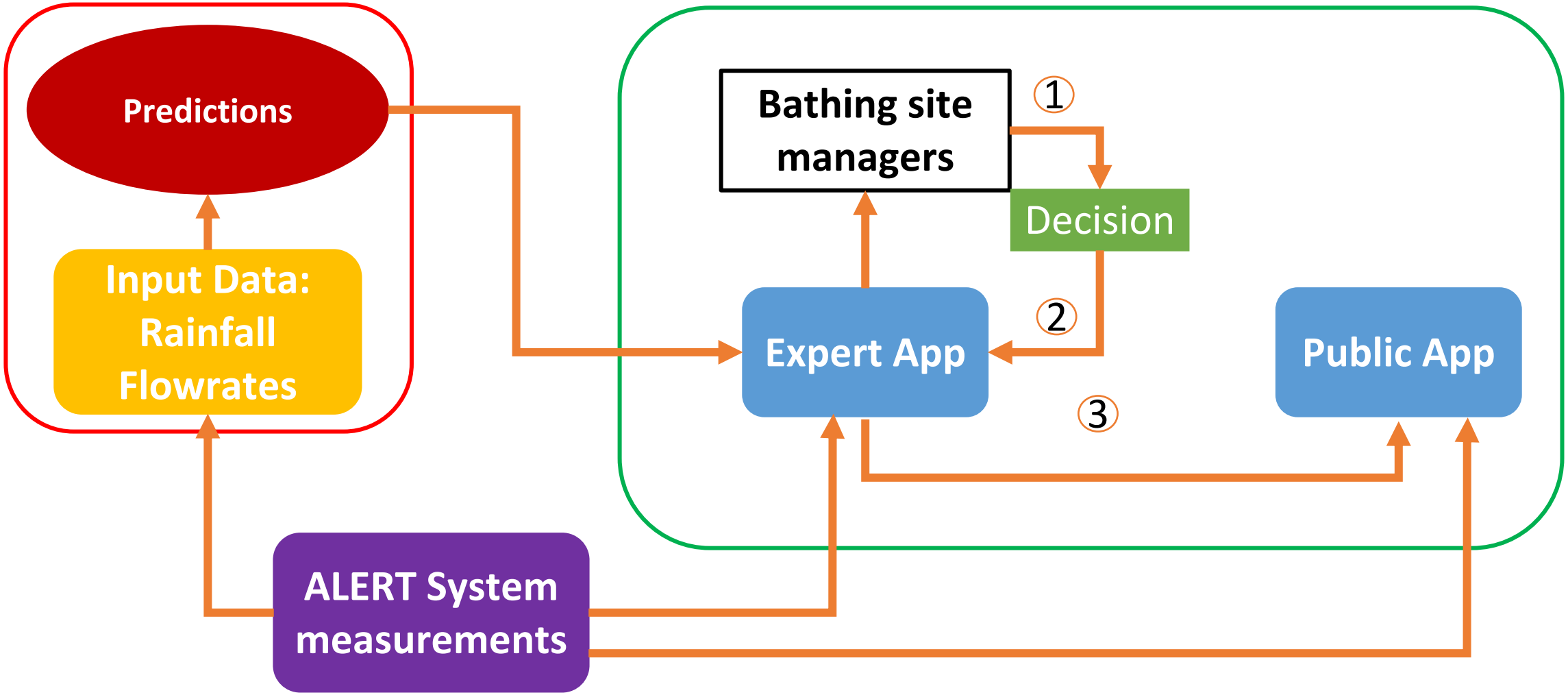
SIAAP
Service public de l'assainissement francilien

Via un prestataire



Mockup: Technologiestiftung Berlin

Daily functioning of the Early Warning System

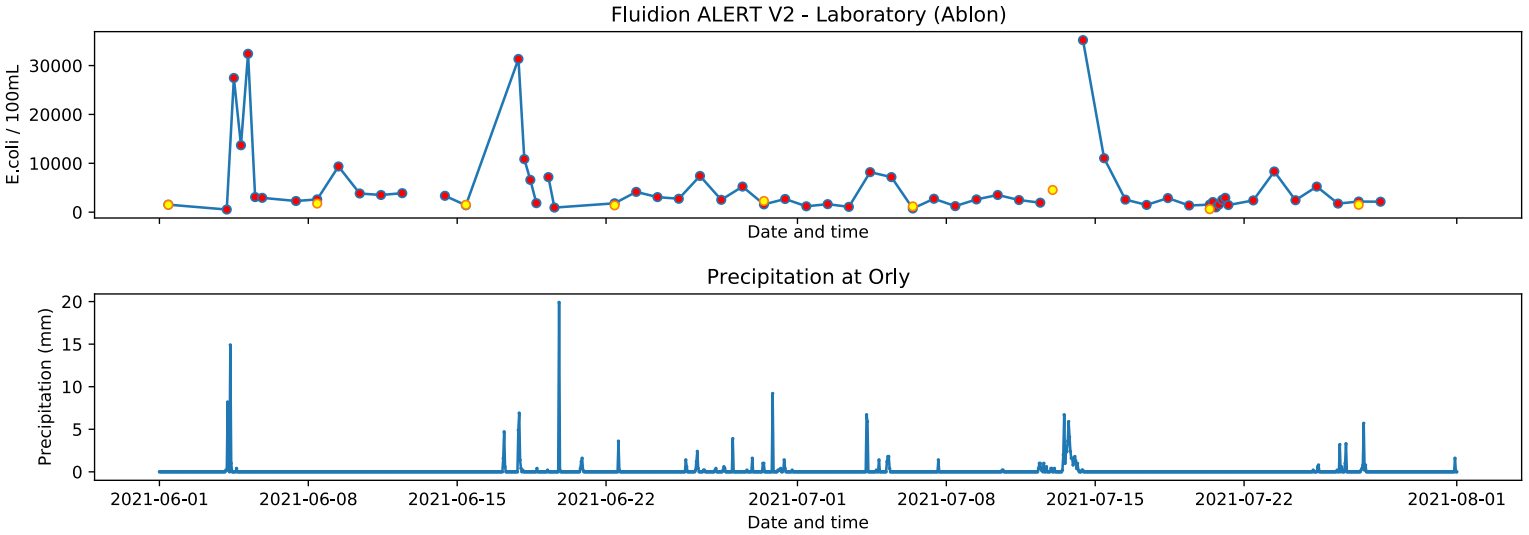


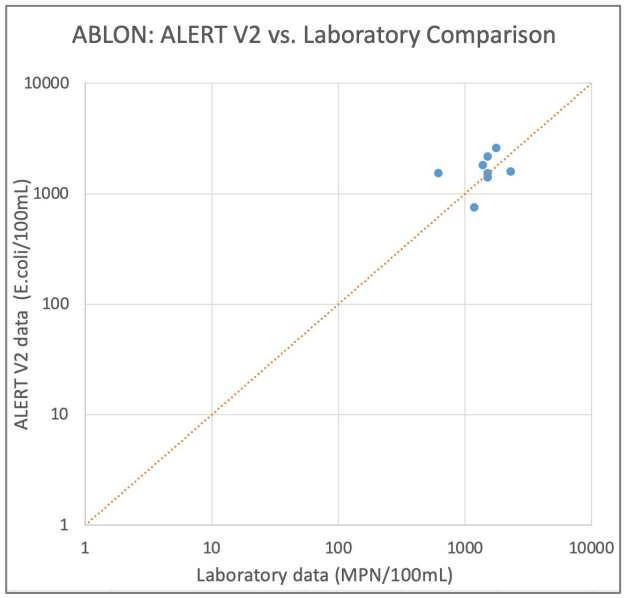
Fluidion ALERT V2 technology

- Accurate **E.coli** measurements, **in-situ**
- Fully autonomous, provides automated alerts
- Battery operation and worldwide wireless communication
- Powerful data repository and analytics platform
- Can combine with other external senso

  - Conductivity
  - Turbidity
  - pH
  - Dissolved Oxygen
  - fDOM
  - Chlorophyll
  - Phycocyanin
  - Nitrate
  - Total Ammonia

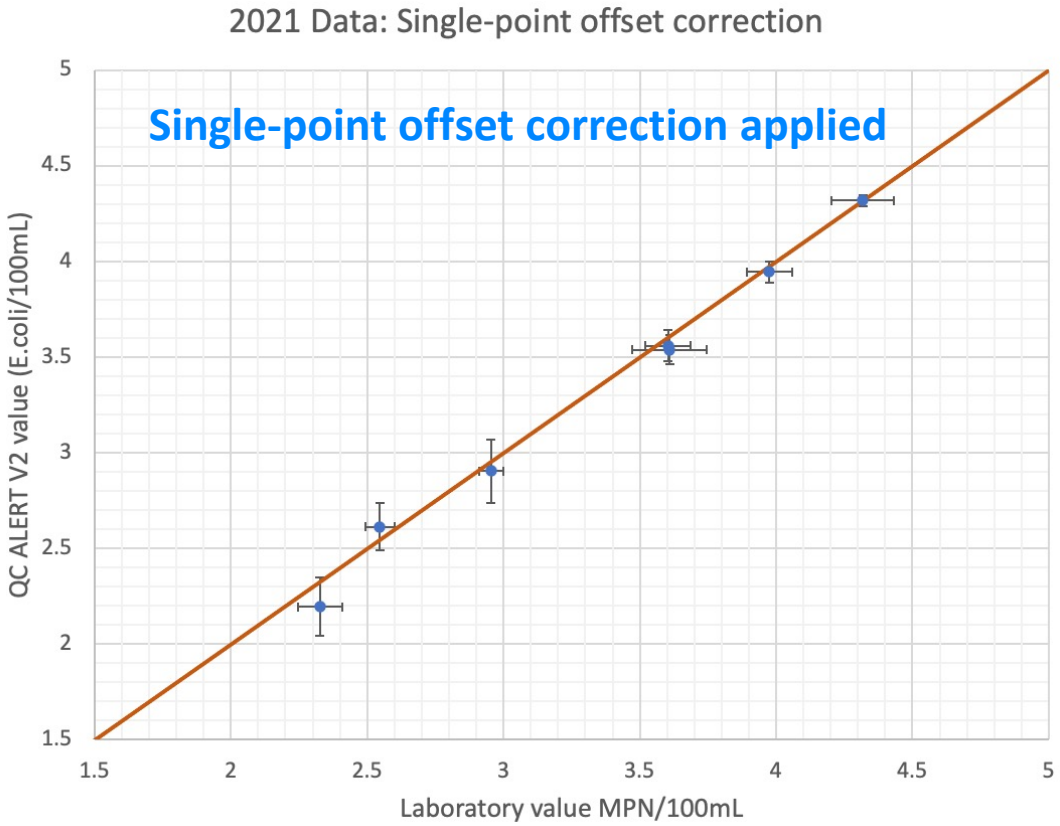
ALERT V2 - Paris operational installation



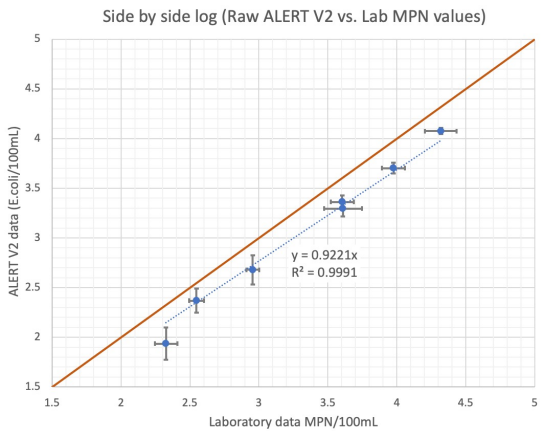


- ✓ Side-by-side analysis
- ✓ Observe wet and dry weather pollution
- ✓ High-frequency in-situ data
- ✓ Monitor CSO pollution
- ✓ Measure clean-up times

ALERT V2 – Berlin repeatability study



Alert V2 (2021 Berlin study)

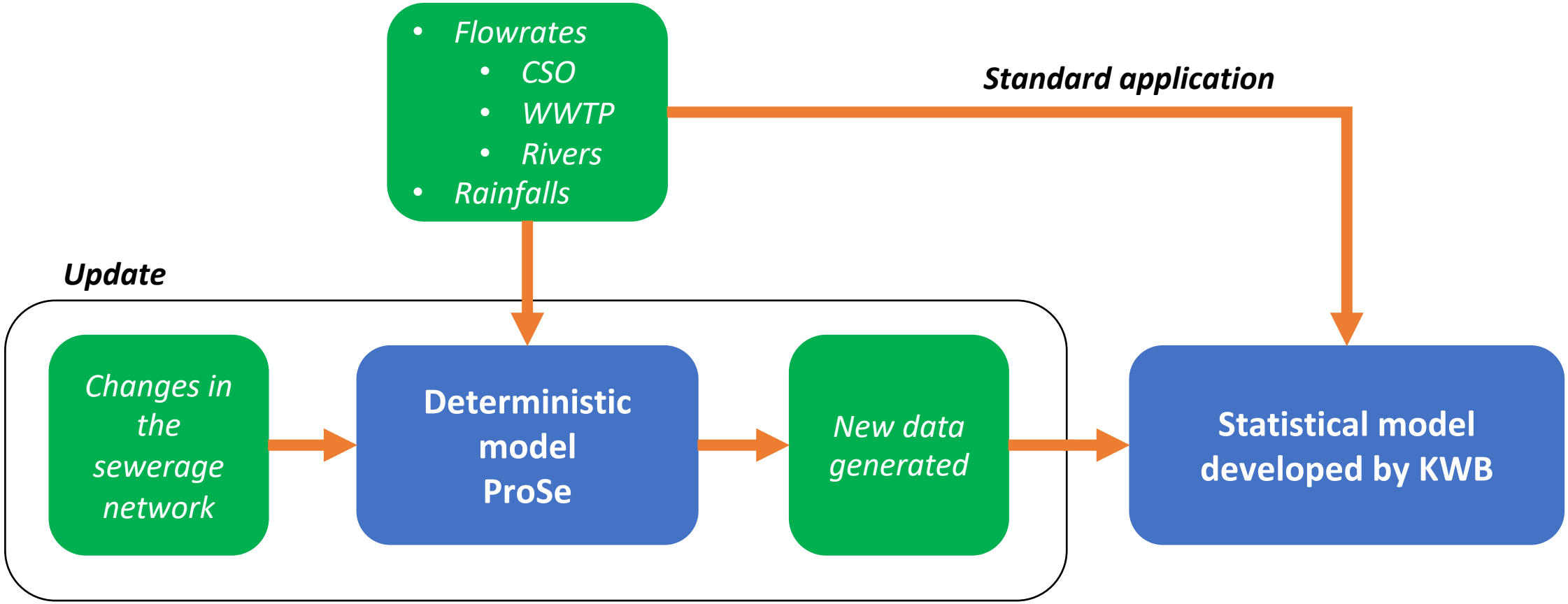


Achievements:

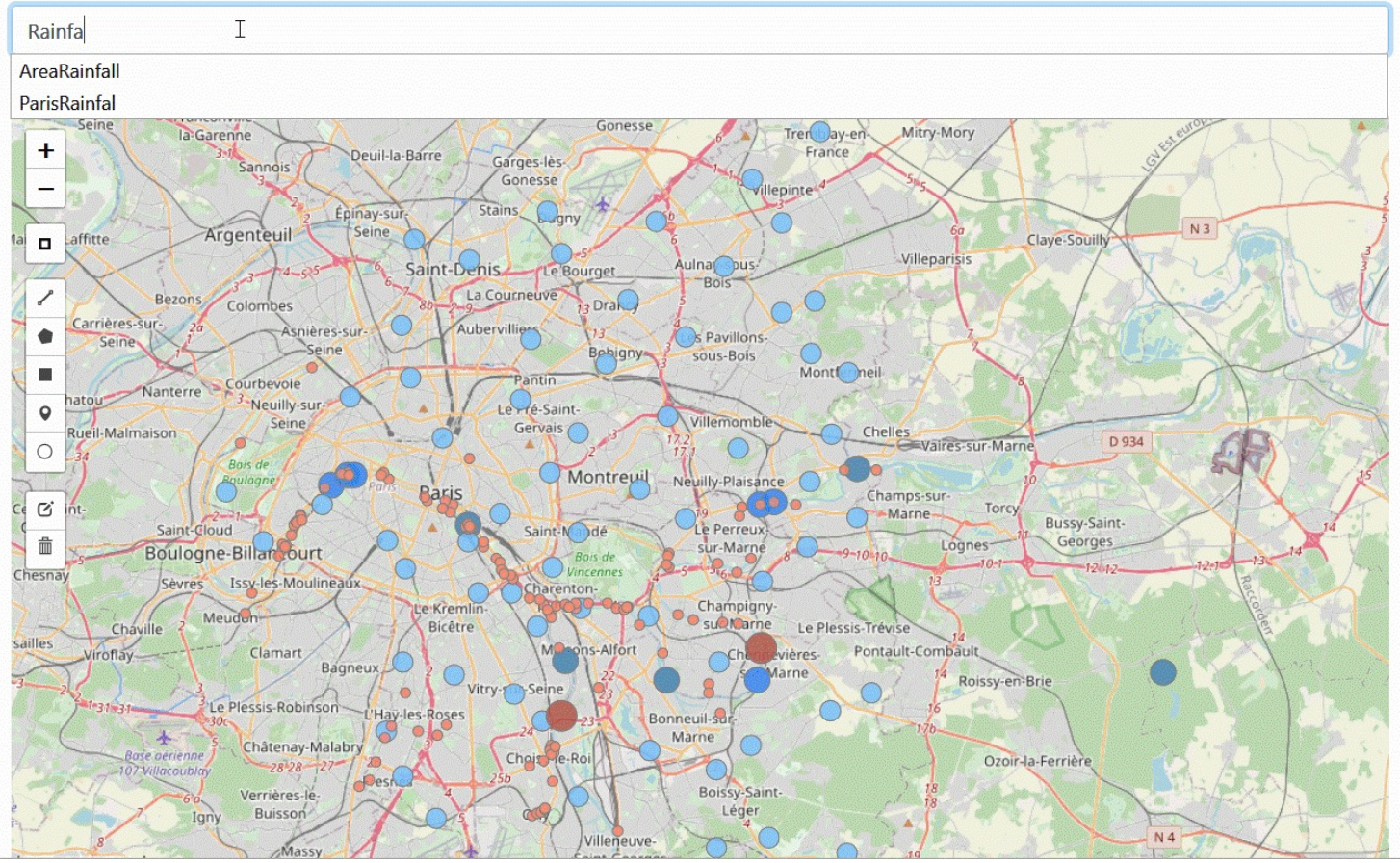
- ✓ 7 dilutions + blank
- ✓ 53 ALERT V2 measurements
- ✓ 56 side-by-side measurements
- ✓ No operational issues
- ✓ Excellent linearity, R^2=0.9991
- ✓ Excellent repeatability:

0.15 $\log_{10}$ (V2) vs 0.08 $\log_{10}$ (Lab) @ 200 MPN/100mL
0.08 $\log_{10}$ (V2) vs 0.13 $\log_{10}$ (Lab) @ 4000 MPN/100mL
0.03 $\log_{10}$ (V2) vs 0.11 $\log_{10}$ (Lab) @ 20000 MPN/100mL

Prediction tool

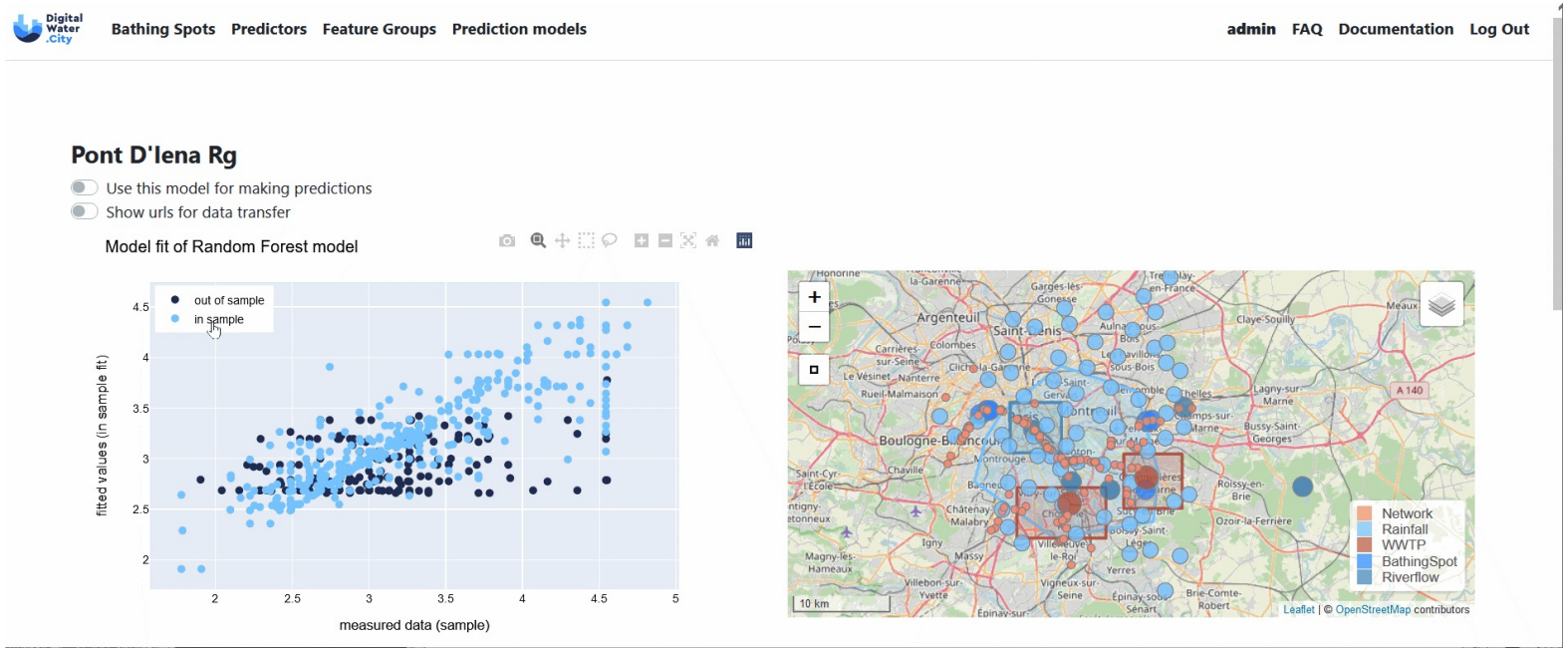


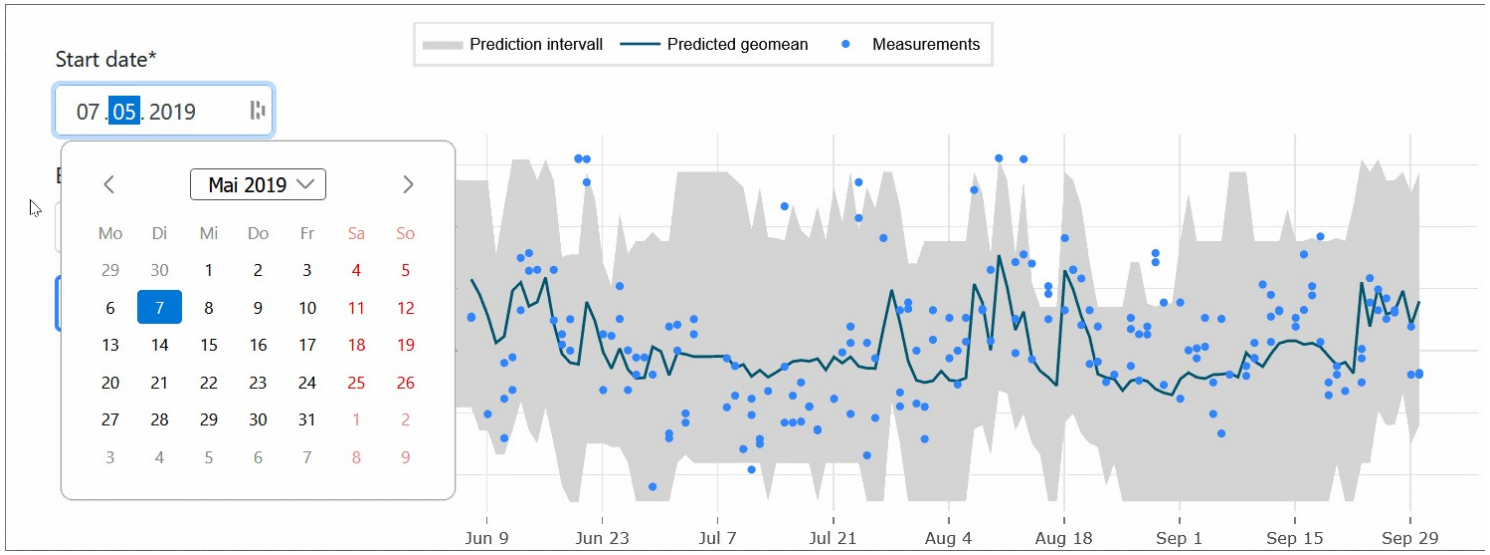
Prediction tool for ML-based EWS



- **Graphical User Interface (GUI)**
- **Content Management System (CMS)**
- Creation of **spatial variables** by an **interactive map**
- **Calibration** and **interactive analysis of state-of-the art ML** and **probabilistic forecasting models**
- **FIWARE Orion Context Broker**

Interactive model analysis





Predictions models constructed for Pont d'Iéna

- **Quantile Random Forest models**
  - Rainfall
  - WWTP
  - Riverflow
- Further **reduction of time-step → improvment of predictions**
- For now, no « sufficiently good water quality » predictions
  - WWTP discharges
  - Wrong connections
  - …
- **Combination with ProSe**
- **Scheduling functionality**

The applications

Expert App **Public App**

Sociological studies

- Interviews
- Focus Groups
  - Diversifies groups
  - Content of public app
- Community of Practice
  - Members
    - Bathing site manager
    - French partners
  - Role
    - Content of the apps
    - Data needed

Apps development

Provider enrolled by SIAAP

Participation to COP and Focus Groups

Specifications

- Content
- Design
- Technical specificities

Development

- Mock-up
- Prototypes

Acknowledgement

digital-water.city is a research project supported by the European Commission under the Horizon 2020 Framework Programme

Grant Agreement No 820954

Duration: 01/06/19 - 30/11/22

Contact details

SIAAP
Sofia HOUSNI
Sofia.housni@siaap.fr