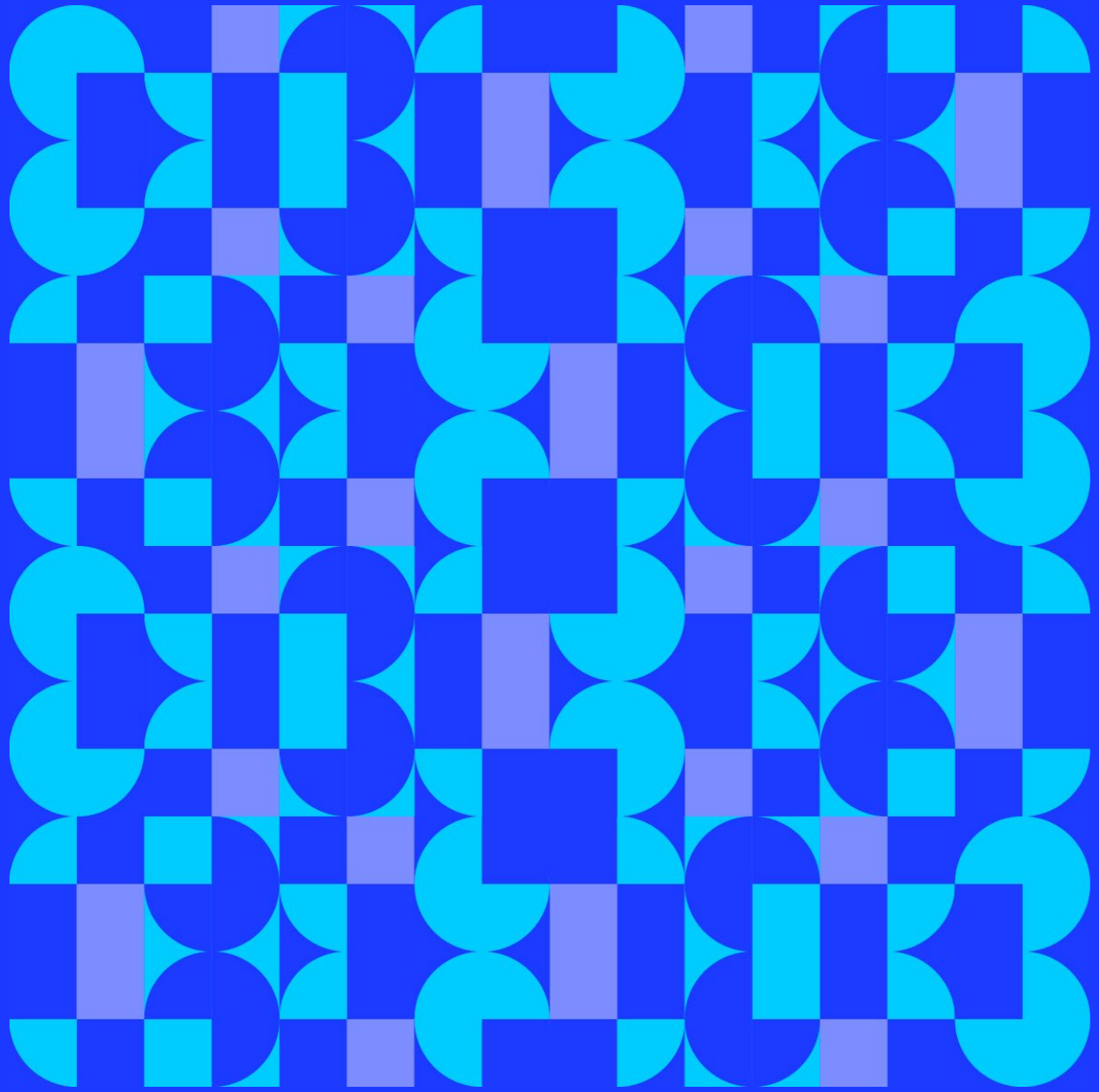
beopen

PORTO pilot

Supporting first responders assessing the impact of incidents with urban mobility data

Porto Digital
Ubiwhere



Pilot Porto – Storytelling & Challenges

Premise: How can we support emergency teams in forecasting, responding to, and recovering from urban flood emergencies?

CHALLENGE

- **Flood risks in Porto** (river and urban).
- **Dependence on external data:** lacks real-time input and detailed granularity.
- **First responders rely on experience** rather than data-driven processes;
- **Event communication strategies need enhancement.**

DATA

HVD

- Observed Meteorology – Porto Digital sensory network
- Traffic Management System - CCTV
- Police and firefighters geolocation buildings (POIs)
- Trees
- Classified Trees

Closed data

- Firefighters occurrences
- Drainage network sensing and Watershed boundaries
- Fire hydrants
- Roadway and street dimensions

TECHNOLOGY

1. Machine learning AI model to forecast floods (Porto Digital)

2. Real time visualization dashboard that show alerts and means localization (Ubiwhere)

Pilot Porto – Stakeholder involvement

Crucial relevance of Porto Steering Committee - our city stakeholders - as:

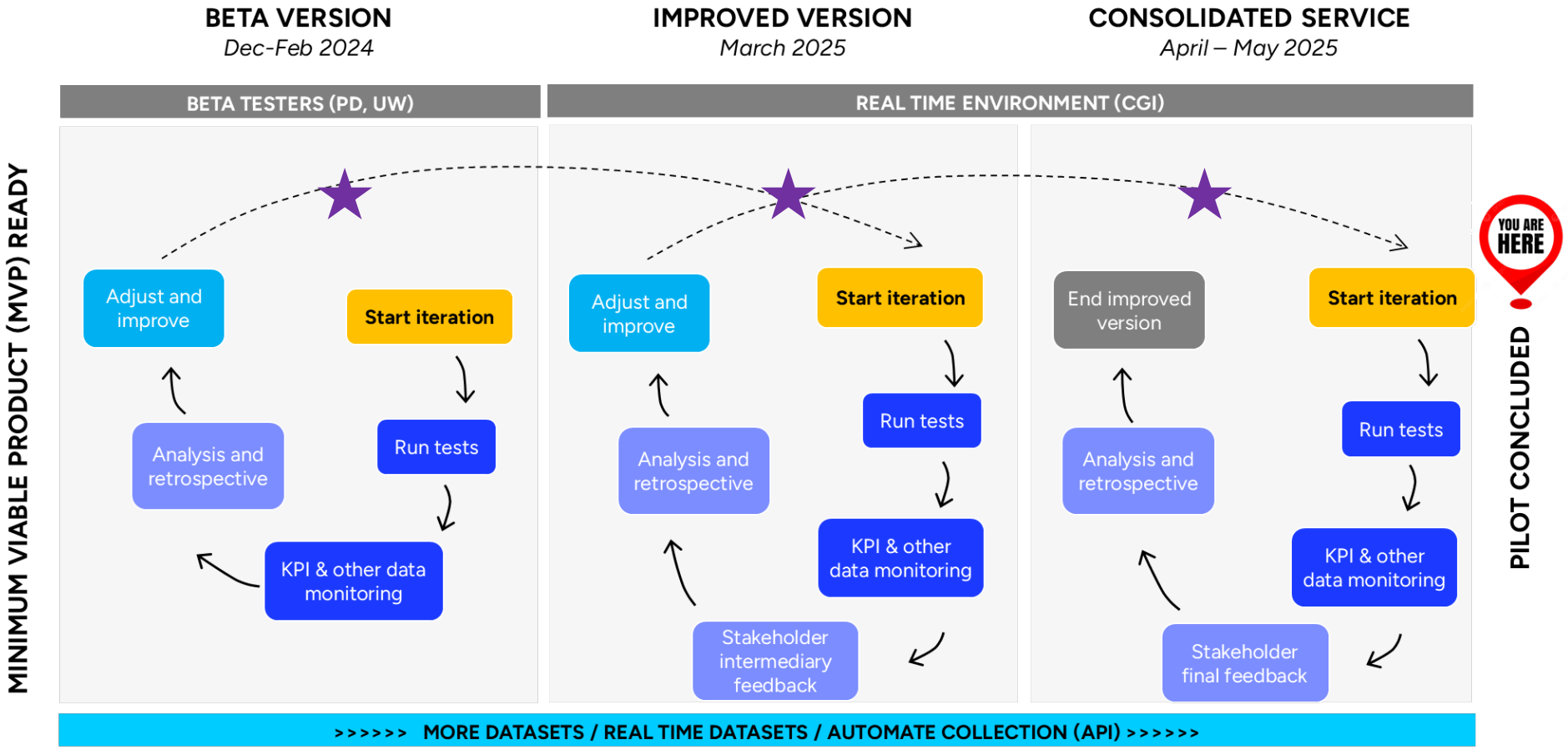
Co-designers of pilot Use Case

Data Owners

Digital Services users

“Source of Truth”

Pilot Porto – Performed activities: agile piloting



★ Integration of new datasets

Pilot Porto – Performed activities

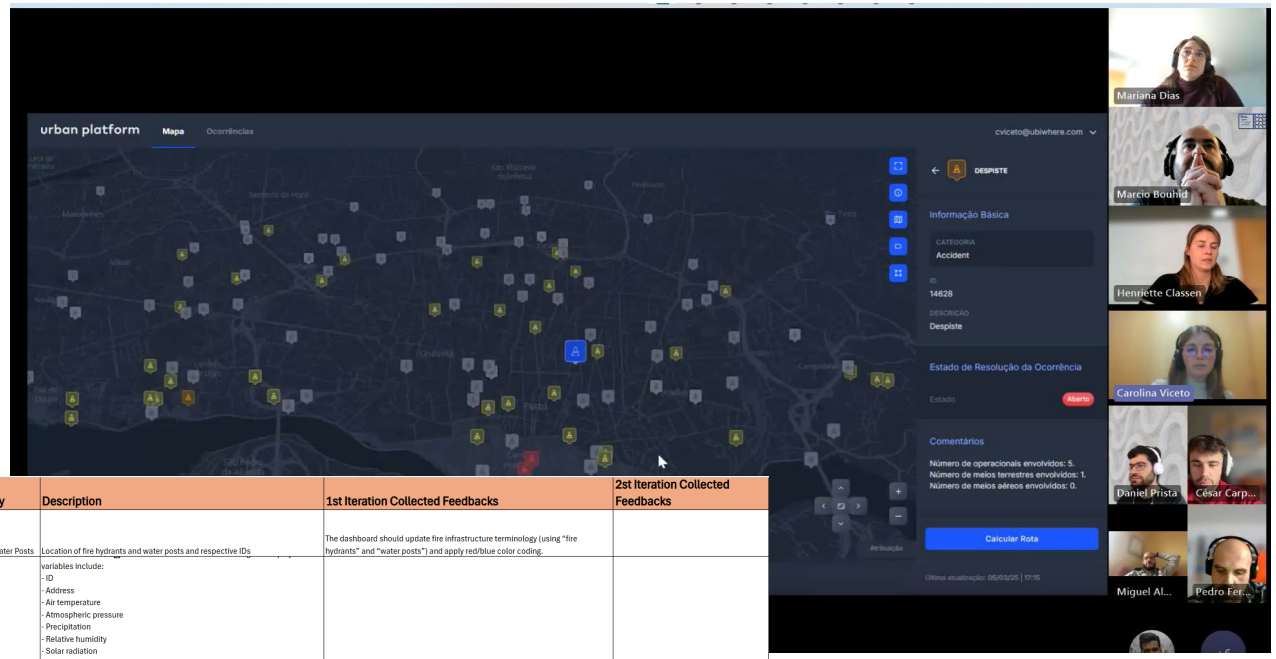
Stakeholder engagement activities

Porto Steering Committee meetings
Data gathering
3 Demo Sessions + feedback loops

- Demo event #1
- Demo event #2
- Demo event #3

Planning and monitoring

Bilateral meetings (Porto Digital – UW)
Multilateral meetings (Porto Digital – UW – Data Owners)



#	Functionality	Description	1st Iteration Collected Feedbacks	2st Iteration Collected Feedbacks
1	Fire Hydrants & Water Posts	Location of fire hydrants and water posts and respective IDs	The dashboard should update fire infrastructure terminology (using "fire hydrants" and "water posts") and apply red/blue color coding.	
2	Weather Data	variables include: - ID - Address - Air temperature - Atmospheric pressure - Precipitation - Relative humidity - Solar radiation - Wind direction - Wind speed The **observed meteorology** includes the last variable update and the historical records for the current day (hourly information). **Weather forecast** for Porto Metropolitan Area for the current day and following 10 days. Displayed variables include: - Minimum and maximum air temperature - Relative humidity - Wind speed - UV index The weather forecast also displays historical data for the last 7 days (hourly data). The POIs include the location of fire stations and police departments. The displayed information includes:	**Enhancement:** Include wind speed history and forecast data. **Technical Note:** Forecast API in use is Apple Weather Kit; observed data comes from the sensor network.	

Pilot Porto – Performed activities

Technical activities

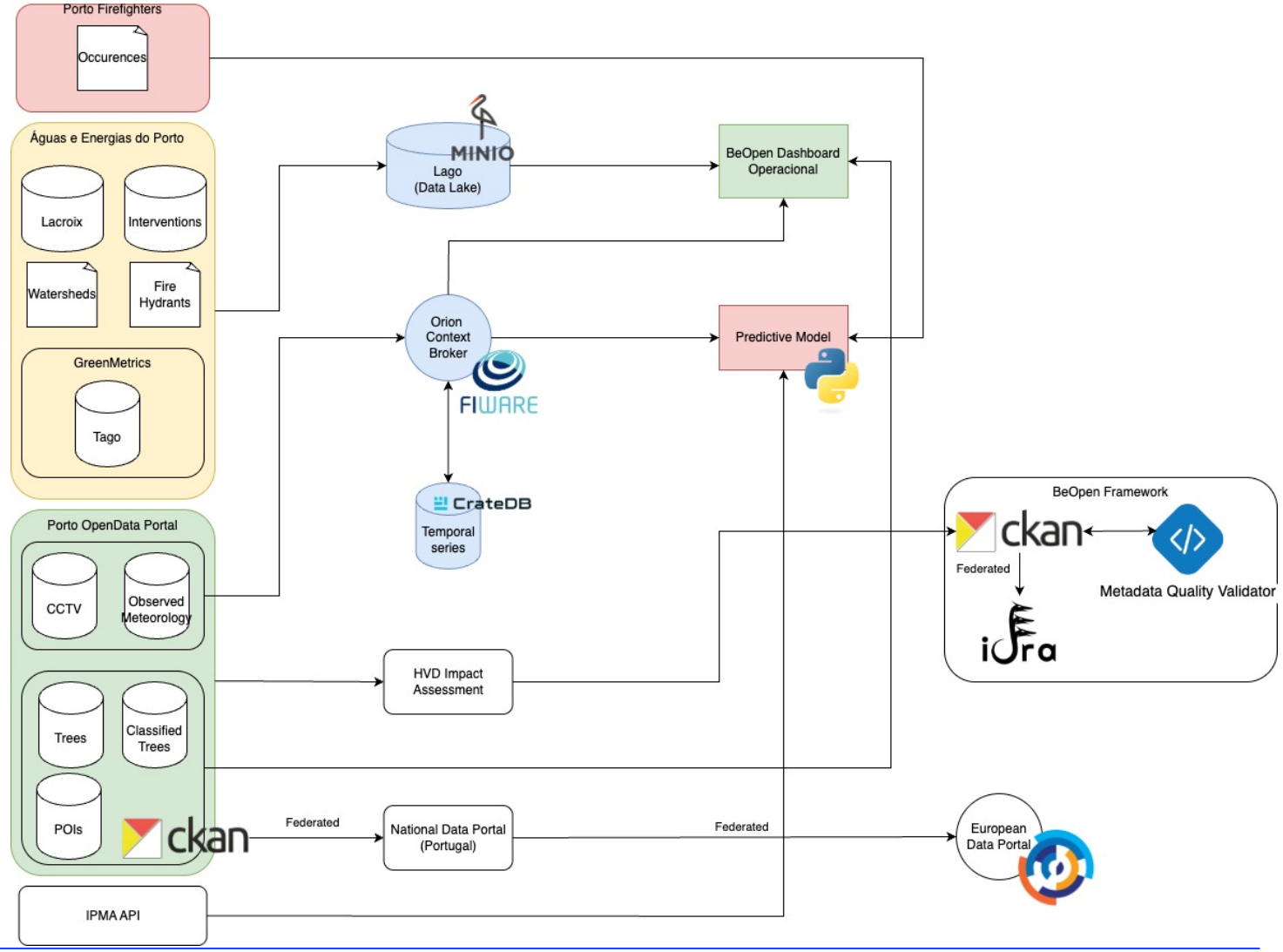
DS1: MACHINE LEARNING AI MODEL TO FORECAST FLOODS (PORTO DIGITAL)

- **Developed a predictive model for urban floods**, including data preparation, model training, evaluation, and initial validation;
- **Analyzed and documented the failures and limitations of the implemented predictive model.**
- Added urban flood data to the existing MinIO object storage, making it accessible for internal sharing and integration;
- Integrated relevant data into the Orion Context Broker, enabling real-time access to contextual information;
- **Improved datasets scoring to become HVD** (documentation, license)
- Published additional datasets on the BeOpen CKAN portal;
- **Enabled federation of the Porto CKAN portal with the National Open Data Portal** (Portugal), allowing the data to also be harvested by the European Data Portal;

DS2 - REAL TIME VISUALIZATION DASHBOARD THAT SHOW ALERTS AND MEANS LOCALIZATION (UBIWHERE)

- Developed an **initial design** for the **real-time visualization dashboard**.
- Integrated **municipal incident data** into the dashboard and implemented **route optimisation** to calculate the most efficient path from the relevant department to the incident location.
- Participated in **iterative sessions** with **Porto's stakeholders** to **refine the design** and **customise the dashboard** according to **user requirements.**
- Incorporated **new datasets** through successive iterations, enabling **continuous integration of user feedback**.
- **Expanded the dashboard's scope** beyond the initial objectives by including datasets such as hydrants, watersheds, water flow sensors, and tree inventory.

Pilot Porto – Performed activities



Pilot Porto – Achieved Results & used HVDs

SECURITY

Firefighters Occurrences

Police and firefighter's geolocation buildings

WATER

Drainage network sensing – LACROIX

Floodings – TAGO

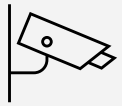
Interventions – NAVIA

Watersheds boundaries

Fire hydrants

WEATHER

Observed Meteorology – Porto Digital sensory network



INFRASTRUCTURE

Traffic Management System – CCTV locations

Trees and classified trees

Roadway and street dimensions

5 datasets improved to HVD after BeOpen

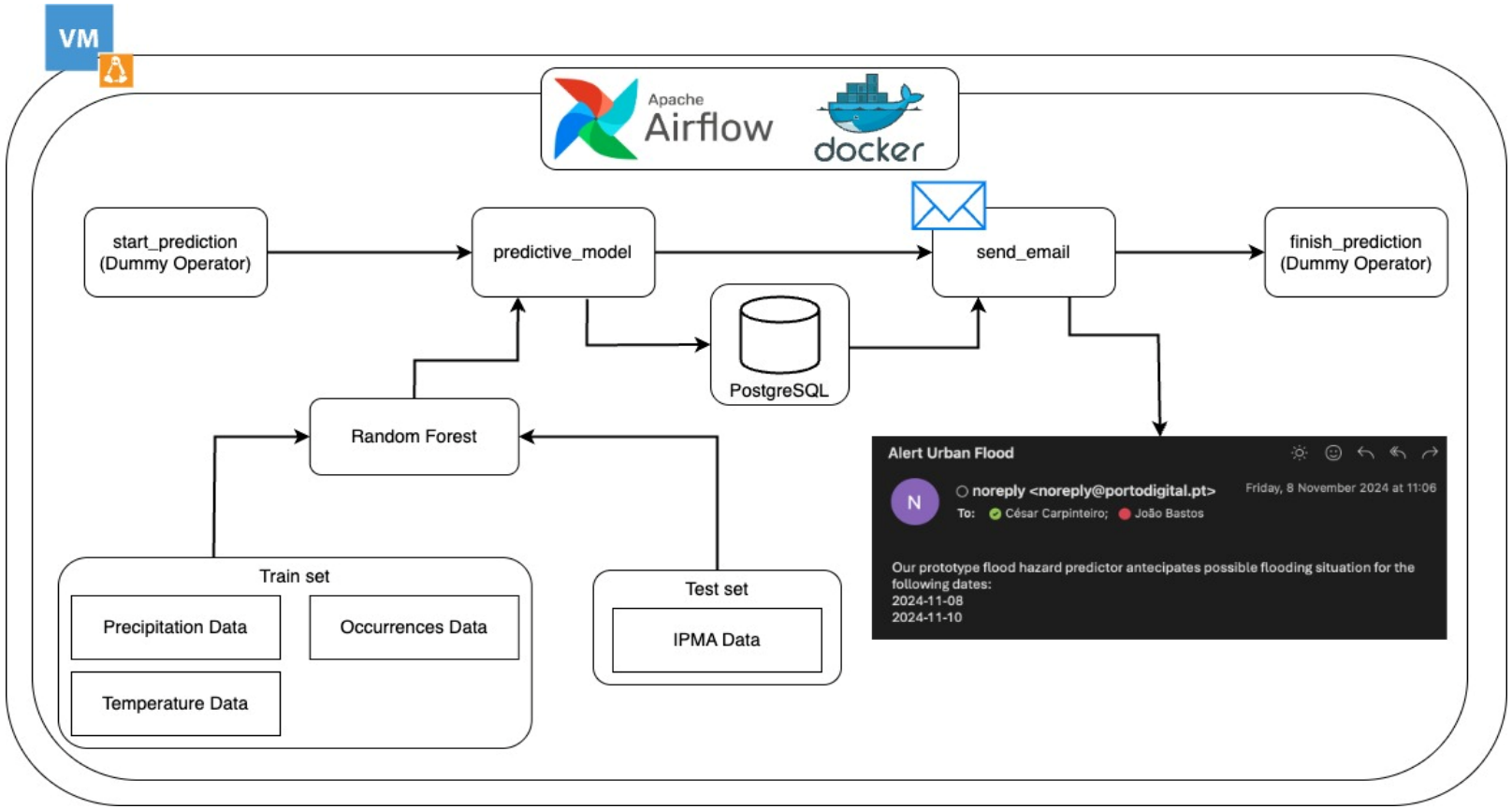
	Score	
Dataset	**Before BeOpen**	**After BeOpen**
CCTVs	70%	100%
Observed Meteorology	70%	100%
POIs	70%	100%
Trees	0%	100%
Classified Trees	0%	100%

Due to the UC thematic constraints, some of the data used cannot be made available as open data

Challenges in applying an Open Data License that complies with High-Value Dataset (HVD) criteria.

Pilot Porto – Achieved Results & used HVDs

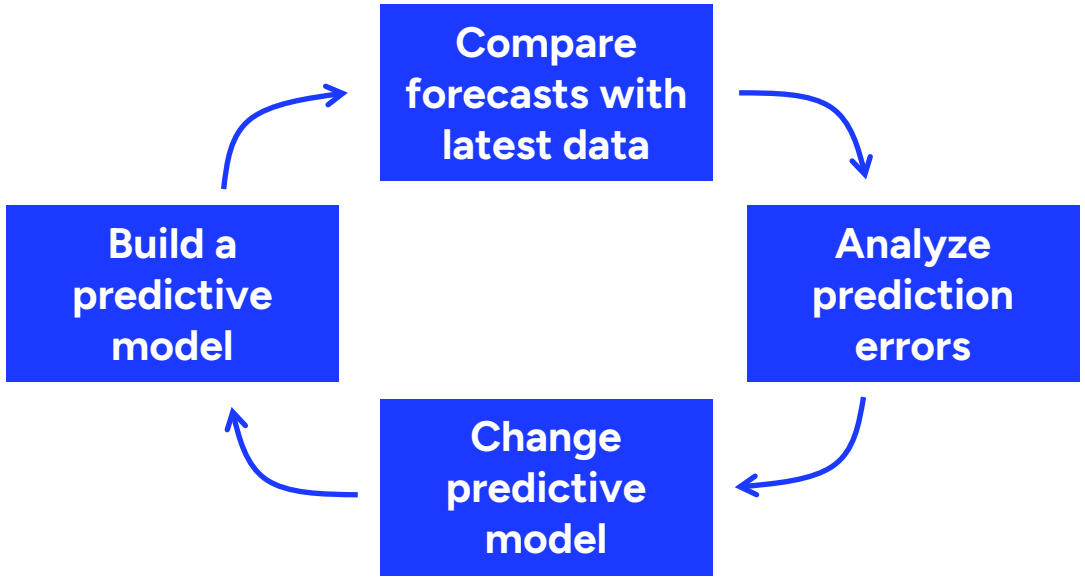
DS1 - Machine learning AI model to forecast floods
(Porto Digital)



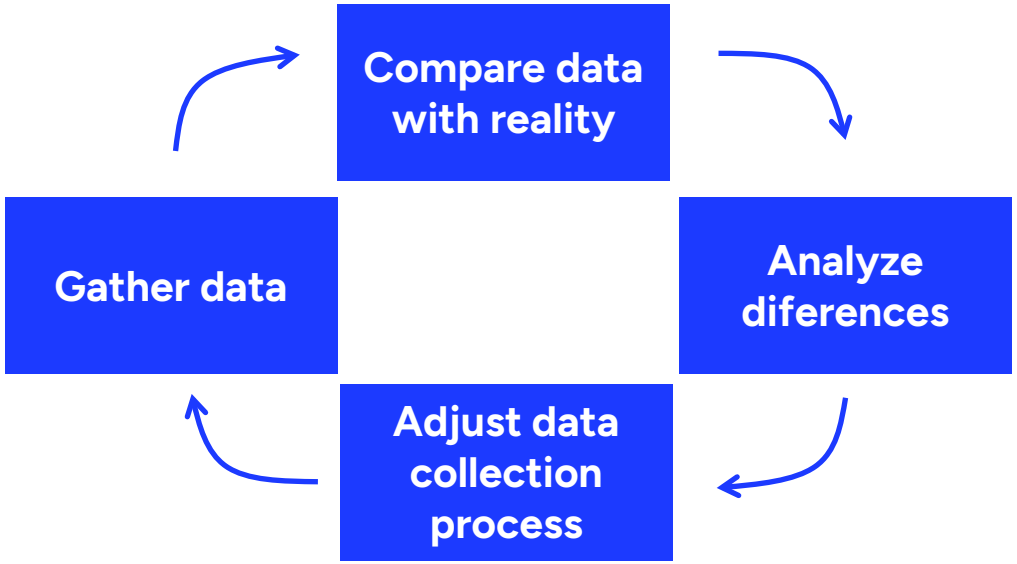
Pilot Porto – Achieved Results & used HVDs

Two types of problems

***Problem #1:** are the forecasts consistent with the data?*



***Problem #2:** are the data consistent with reality?*



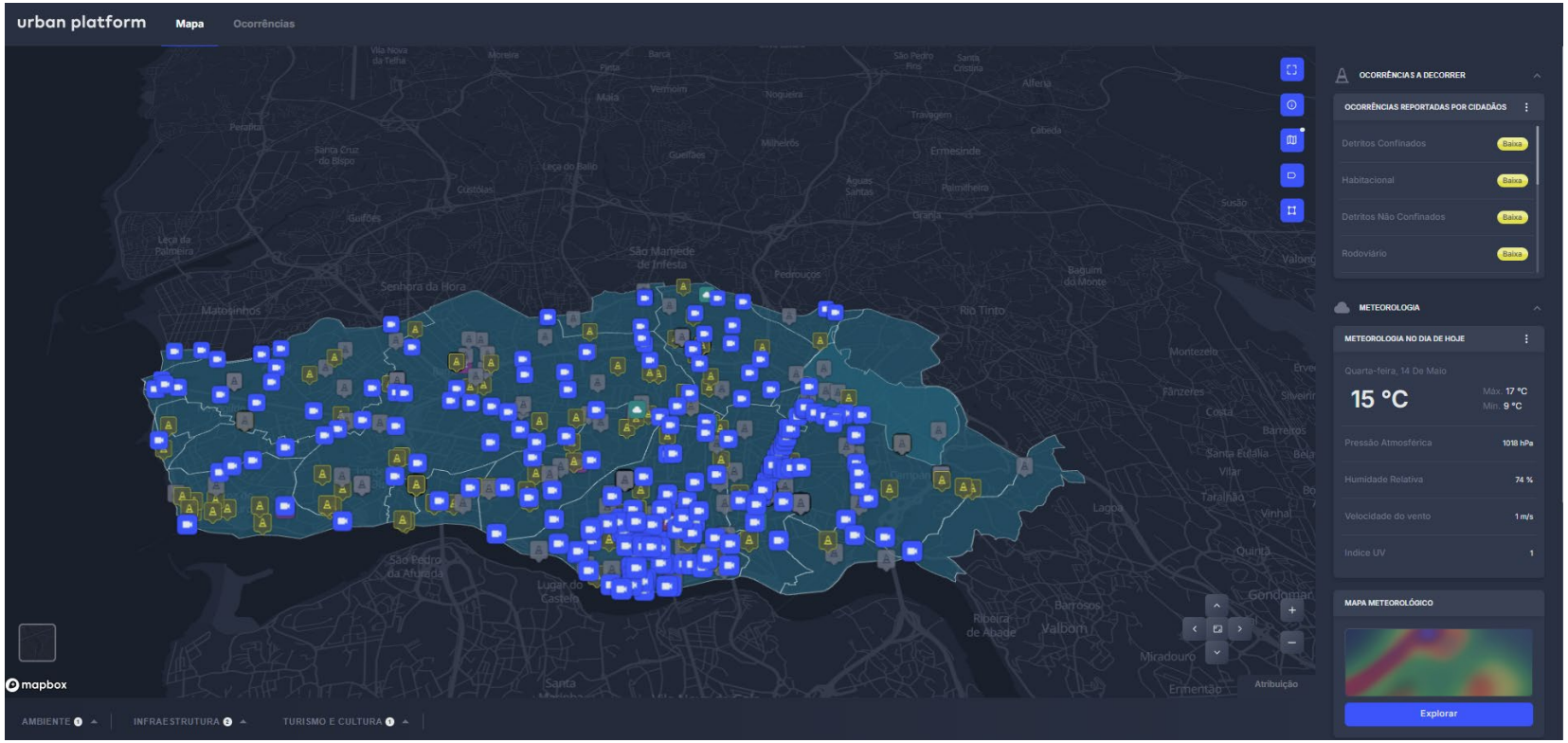
Pilot Porto – Lessons learned

DS1 - Machine learning AI model to forecast floods: lessons learned

1. **OBTAIN good data from continuous sensors (e.g., stormwater collectors)**
   - Easier to work with than discrete occurrences
2. **USE discrete occurrence data to validate continuous sensors**
3. **CREATE alarm systems when continuous sensor values are anomalous**
   - Easier and with fewer false alerts
4. **ITERATE to ensure the data is reliable**
   - By periodically verifying that they match reality (e.g., faulty sensor)

Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*



Pilot Porto – **Achieved Results & used HVDs**

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

- **Centralised information aggregation:** consolidate data from various platforms into a single platform (Urban Platform)
- **Route optimisation:** improve the efficiency of route calculation
- **Real-time data integration:** install sensors in emergency vehicles
- **Municipal data integration:** improve existing data and integrate it into the platform
- **Stakeholder participation:** increase collaboration with emergency services representatives

Pilot Porto – **Achieved Results & used HVDs**

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

1

Involvement of municipal stakeholders

Collection of relevant information for platform development

2

First iteration of the Digital Service

Platform development – integration of occurrences and route calculation

3

Second iteration of the Digital Service

Platform improvement, data integration, optimisation of occurrences and route calculation

4

Third iteration of the Digital Service

Integration of new verticals – meteorology (observed and forecast), flow meters, CCTV, points of interest, watershed, hydrants, tree inventory

Pilot Porto – **Achieved Results & used HVDs**

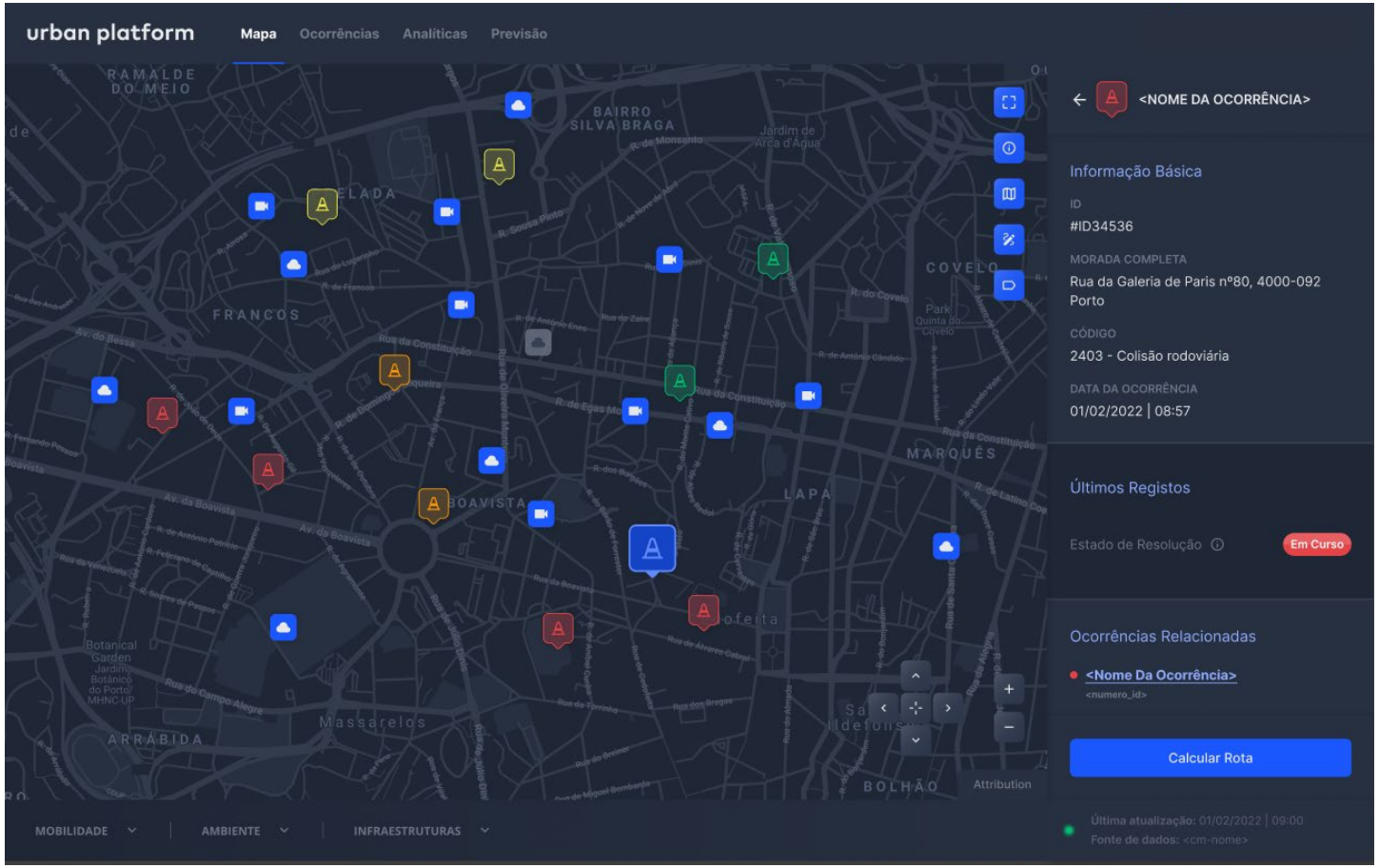
DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Occurrences

Aggregate incident data from different platforms (e.g. fire department, police, water supply and sanitation services)

Routes

Route calculation from the selected department to the incident location



Pilot Porto – **Achieved Results & used HVDs**

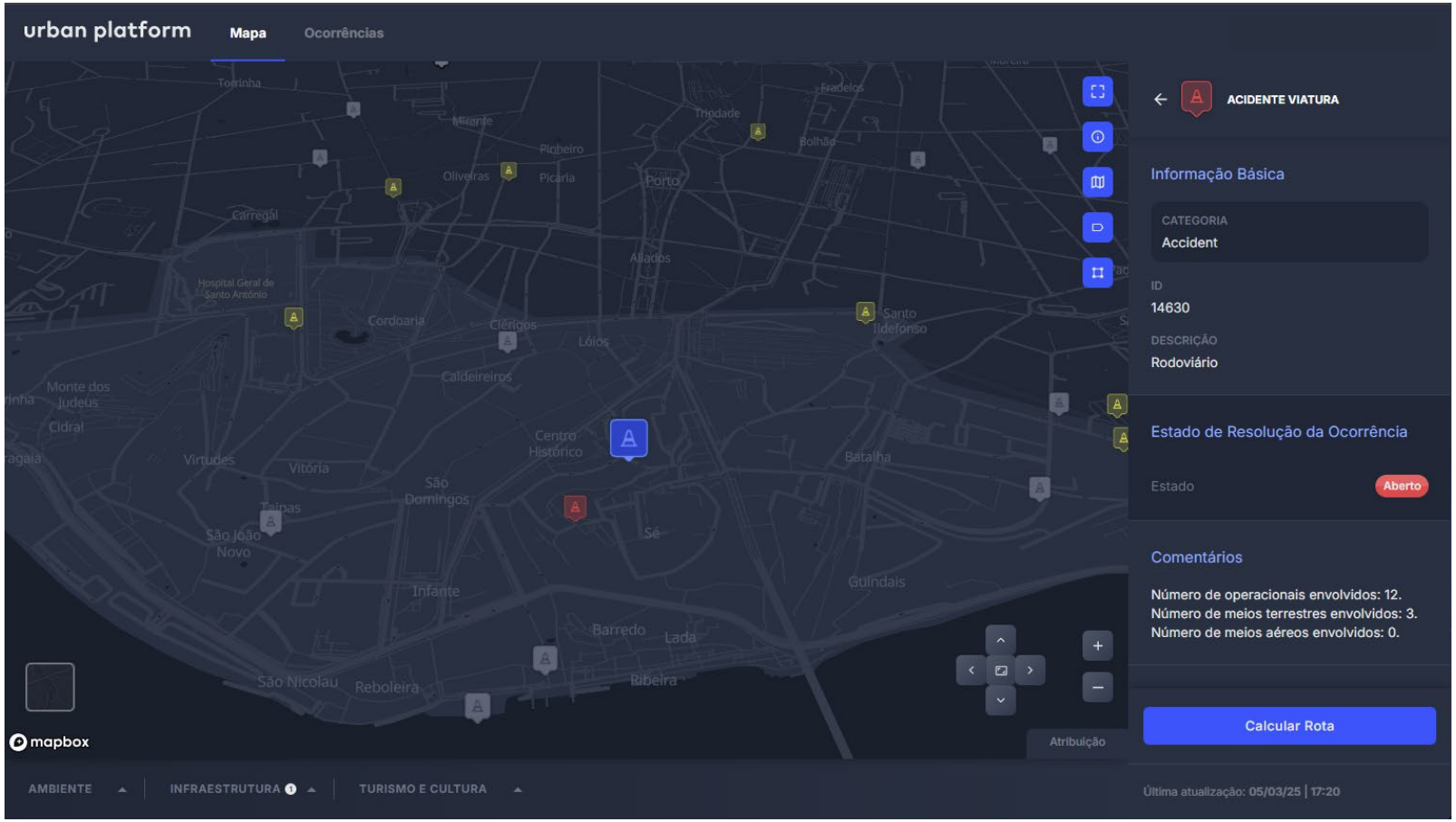
DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

1 Occurrence visualisation

Pilot Porto – **Achieved Results & used HVDs**

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

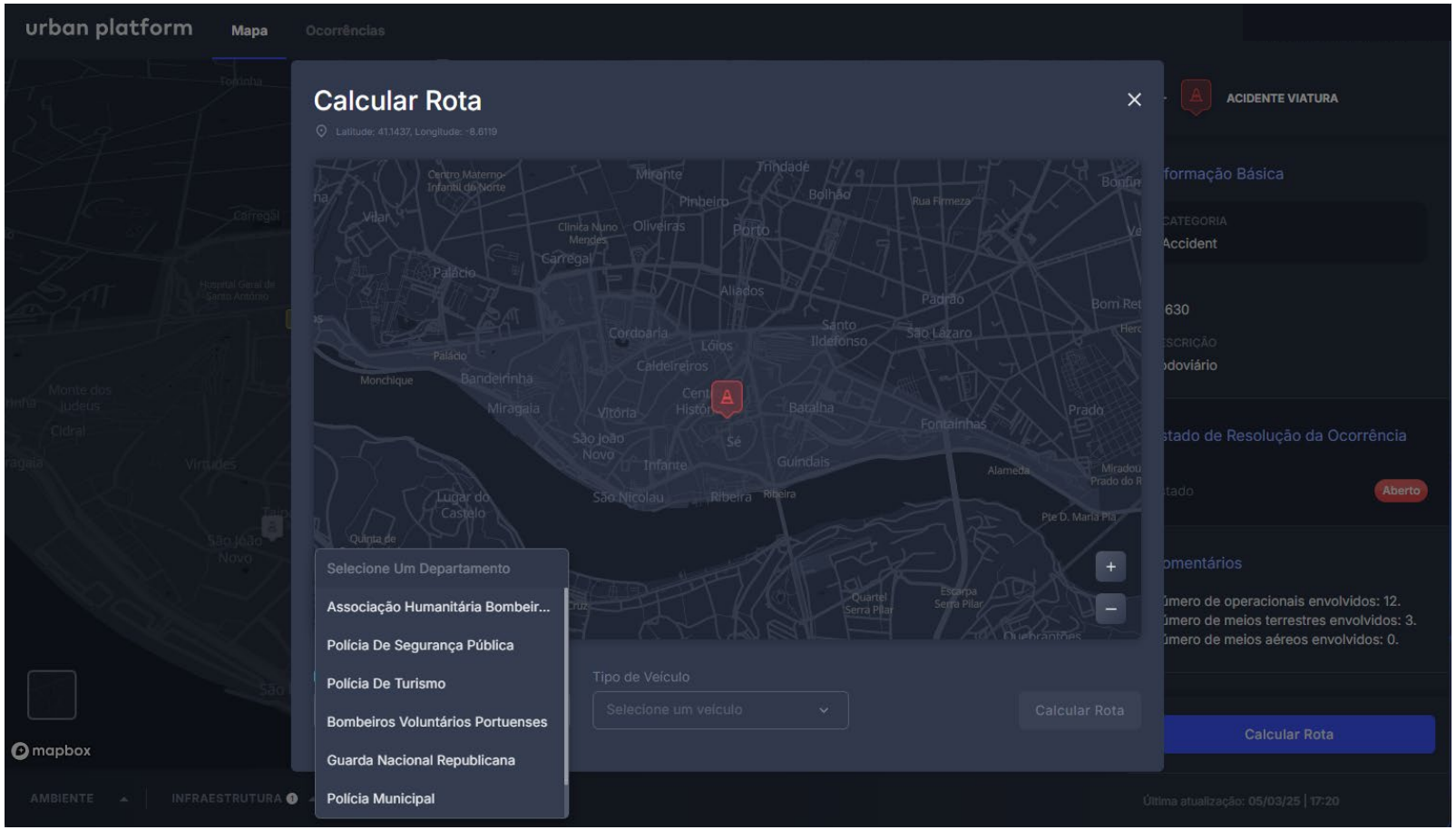
1. Occurrence visualisation
2. Detailed occurrence information



Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

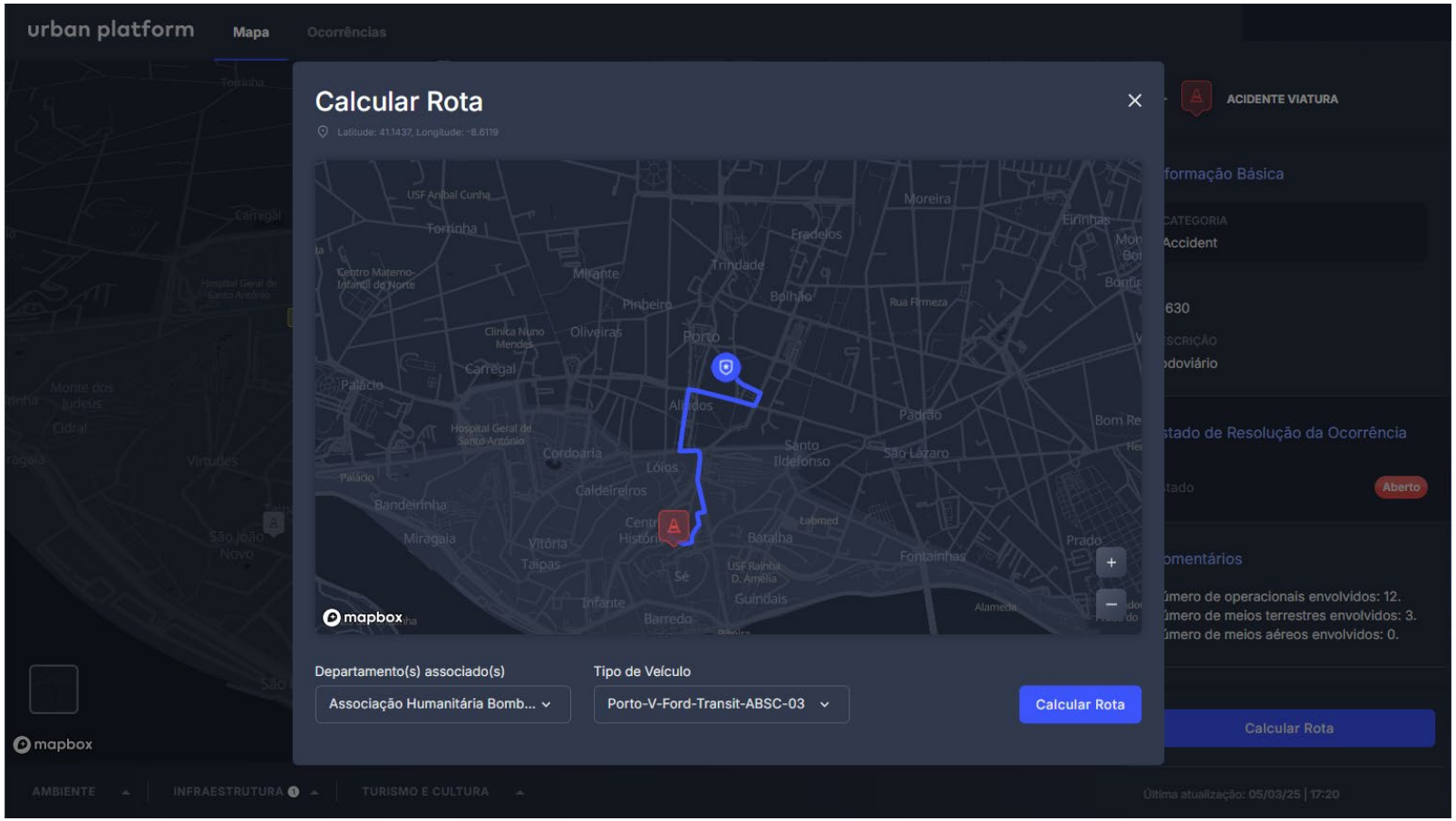
1. Occurrence visualisation
2. Detailed occurrence information
3. Selection of department and vehicle



Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

1. Occurrence visualisation
2. Detailed occurrence information
3. Selection of department and vehicle
4. Route calculation

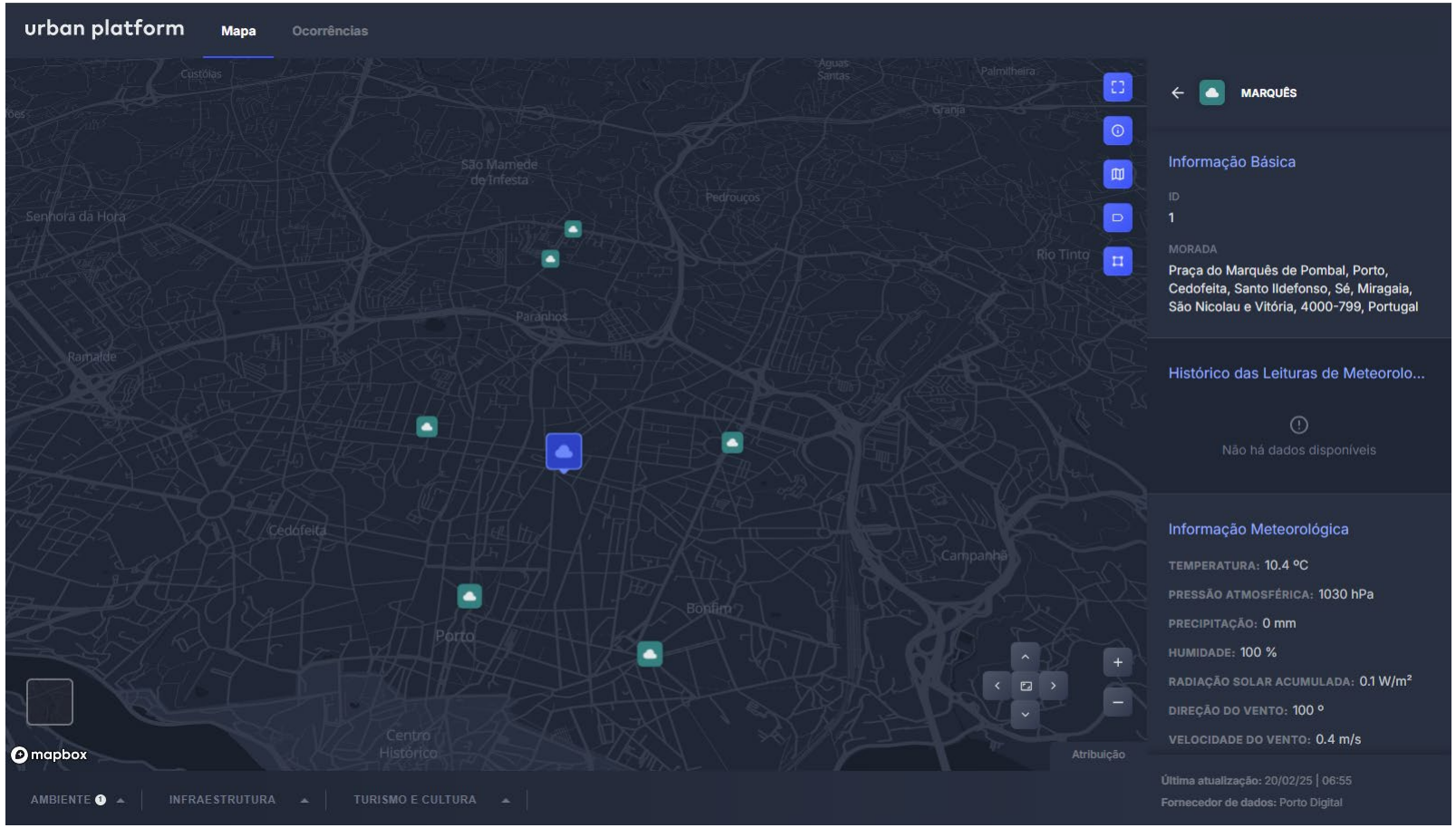


Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Meteorology

Observed – Porto's sensor network



Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Meteorology

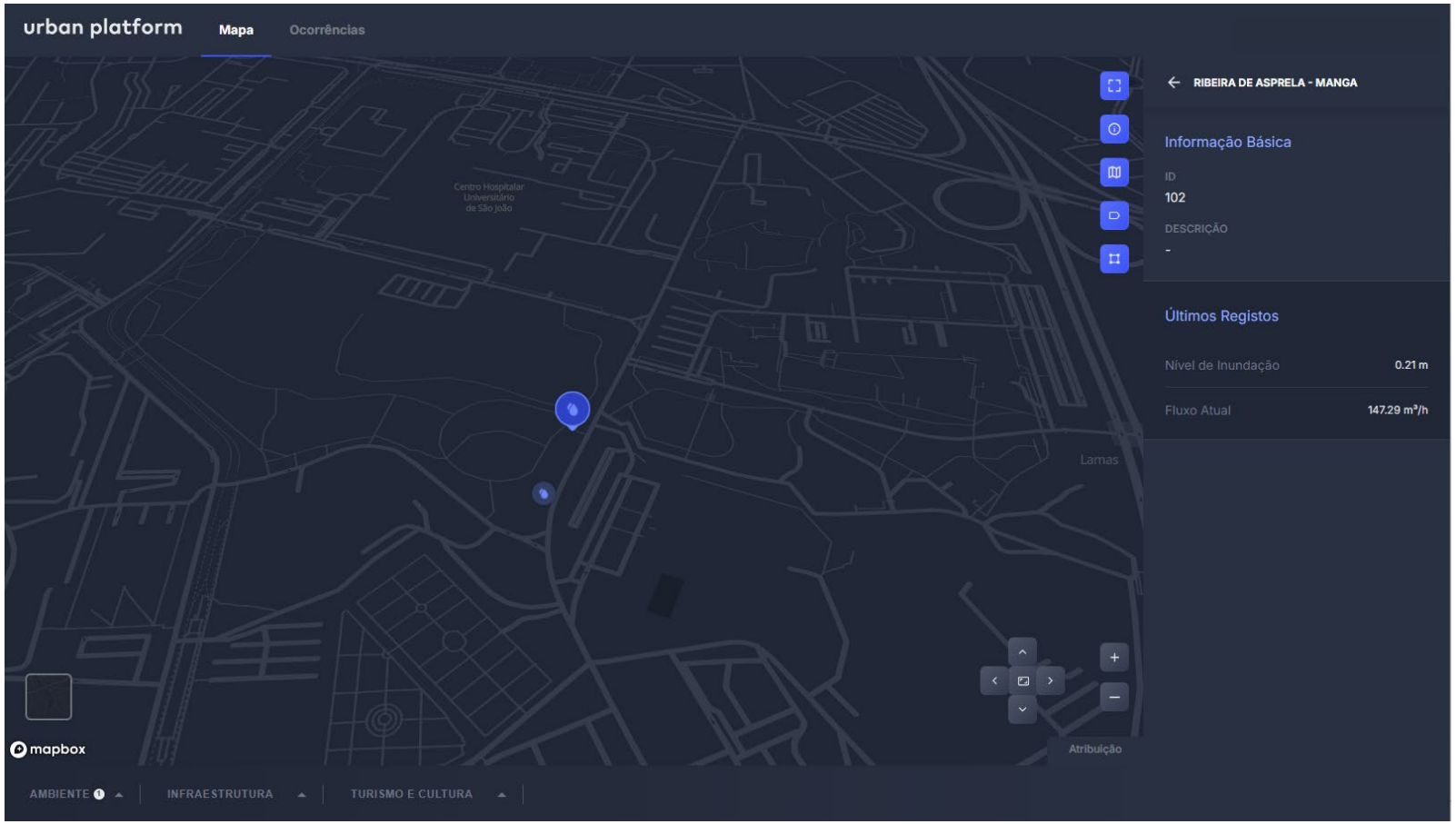
Observed – Porto's sensor network
Forecasted

Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Flow meters

Location
Flood level
Current flow



Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

CCTV

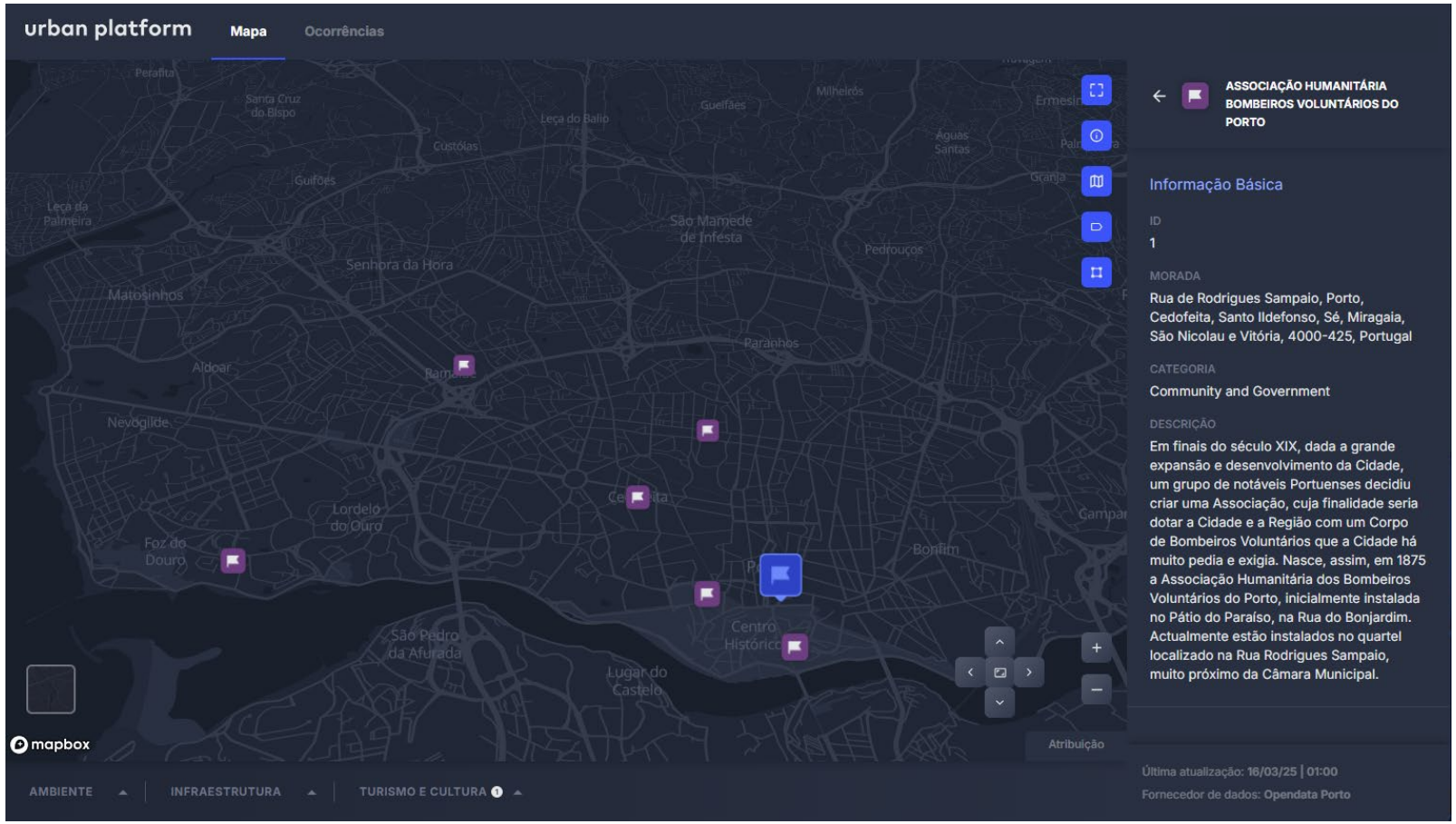
Location
Status

Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Points of interest

Location of police stations and fire departments

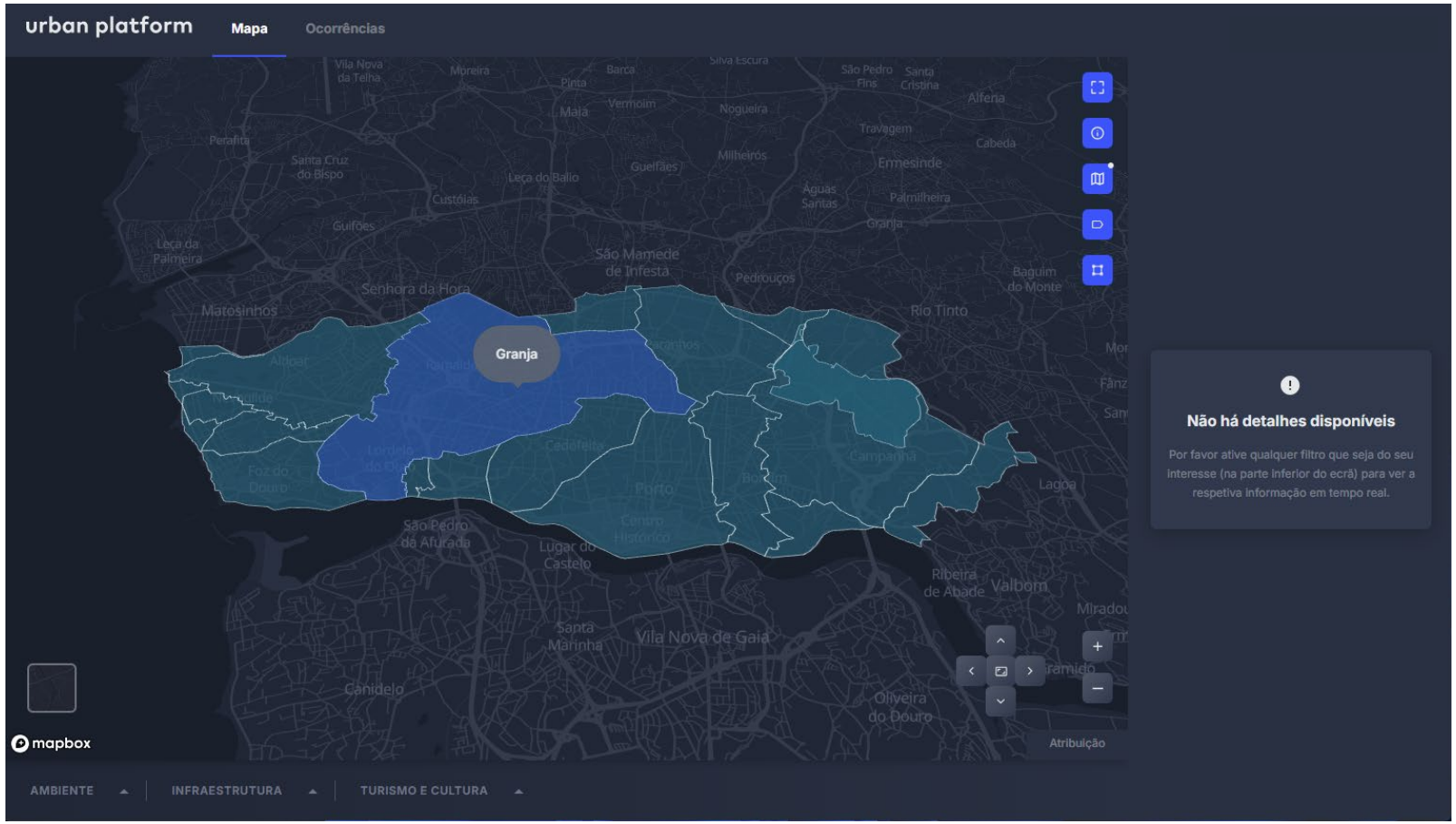


Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Watersheds

Watershed location

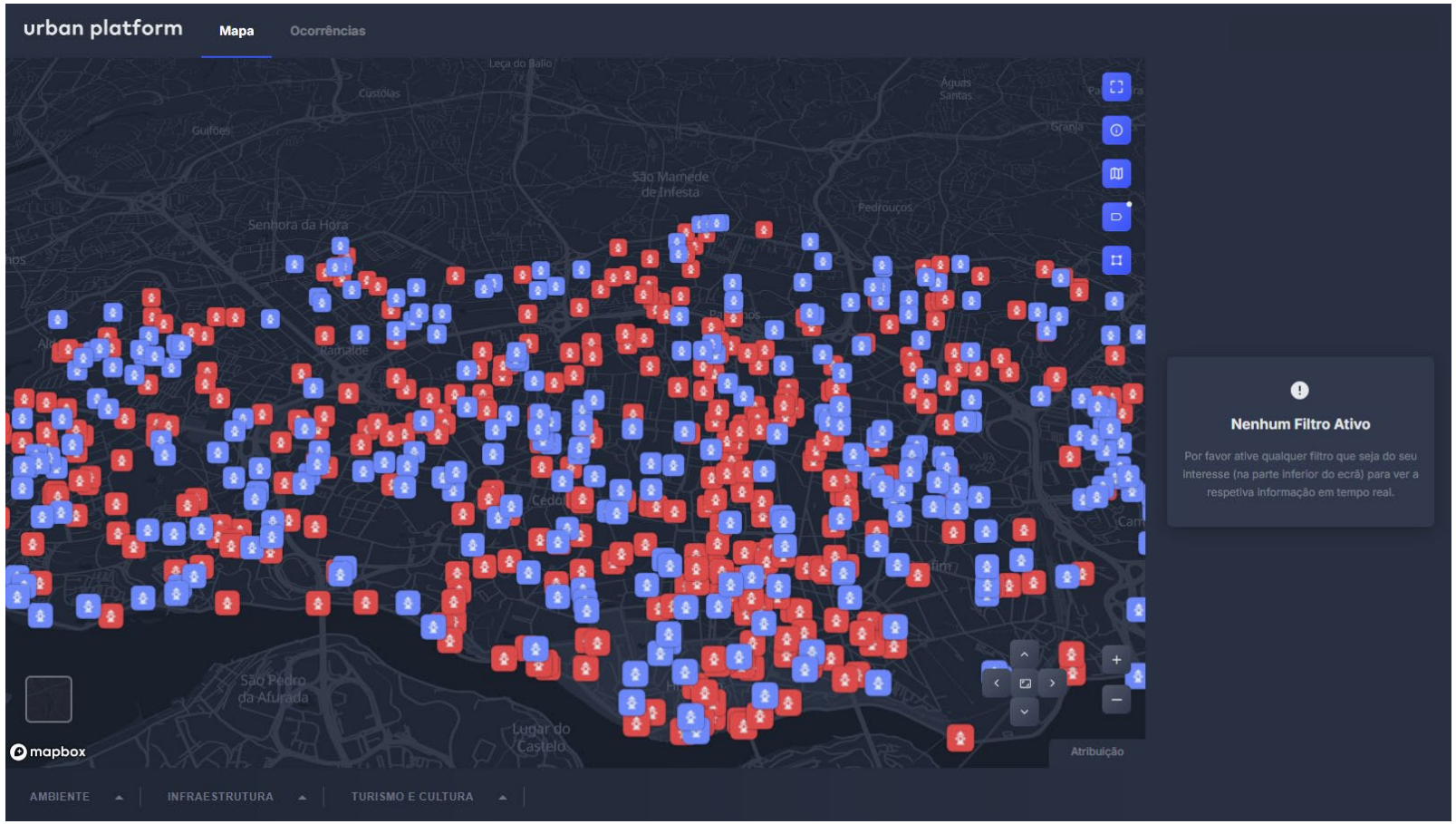


Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Hydrants

Location of water marks
Location of fire hydrants

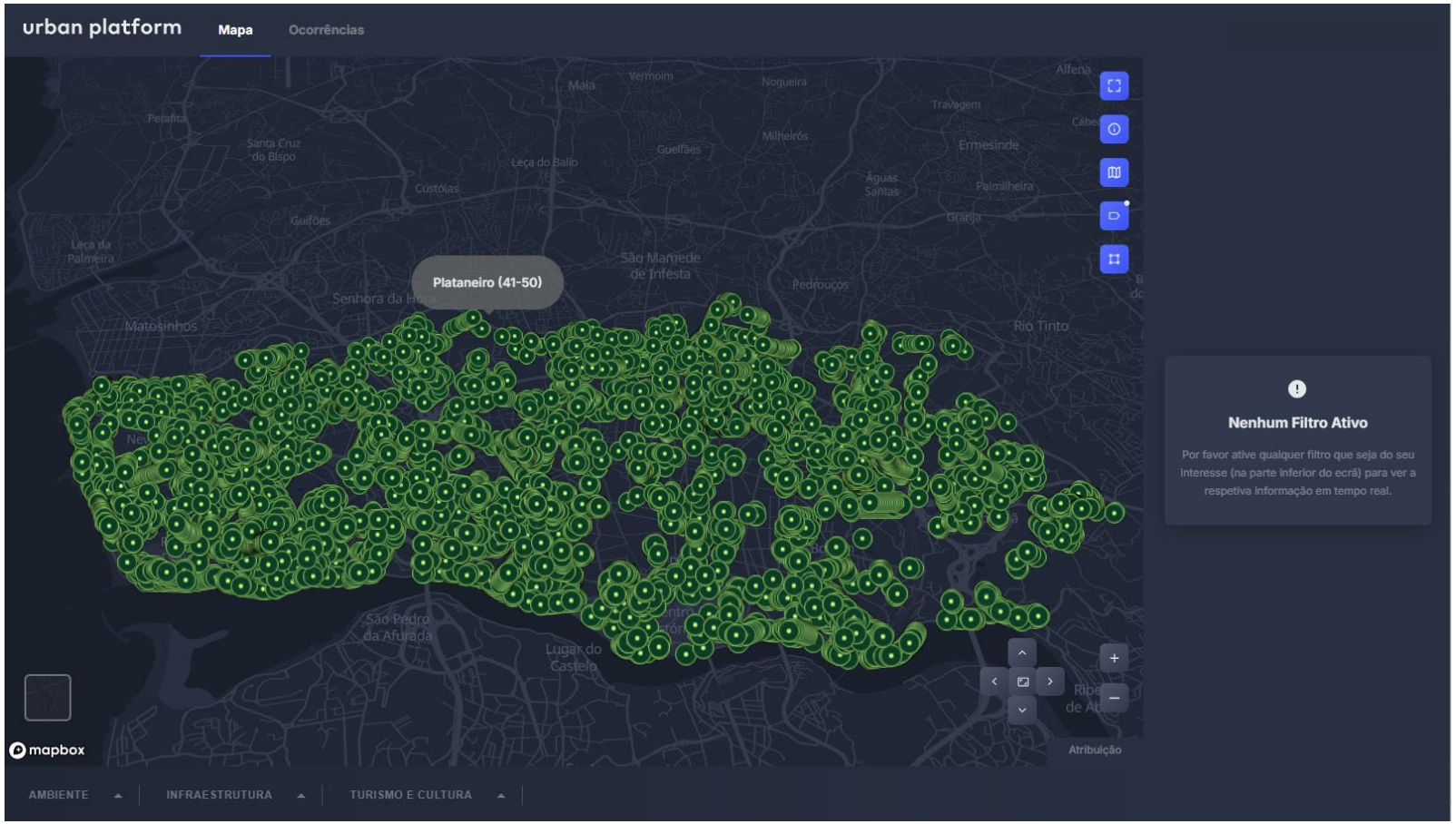


Pilot Porto – Achieved Results & used HVDs

DS2 - Real time visualization dashboard that shows alerts and means localization *(Ubiwhere)*

Tree inventory

Location of trees
Common name
Age interval



Pilot Porto – Lessons learned

DS2 - Real time visualization dashboard that shows alerts and means localization

1. **ENGAGE STAKEHOLDERS to improve data availability and quality**
   - Highlight the value of open data and the importance of high-quality datasets.
   - Demonstrate the potential and impact of the dashboard to enhance this engagement.

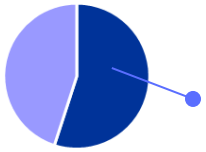
2. **ITERATE based on stakeholder feedback**
   - Conduct regular meetings with municipal stakeholders to ensure the dashboard aligns with their evolving needs and the municipal priorities.

3. **LEVERAGE REAL-TIME AND FREQUENTLY UPDATED DATA to enhance the usability of the dashboard**
   - Highlight the importance of real-time data in supporting informed and data-driven decision-making processes.
   - Emphasise that up-to-date information increases the dashboard's relevance.

Pilot Porto – Achieved Results: impact

INCREASED DATA USAGE

Promoted a culture of data-driven decision-making



55%

of respondents used **geospatial data extensively** post-project

IMPROVED DATA QUALITY & ACCESSIBILITY

Greater data quality and accessibility seen by participants.

60%

perceived **significant improvements**

ENHANCED INSTITUTIONAL COMMITMENT

stronger institutional commitment to open data institutional

90%

reported a "strong commitment" to ongoing development and use.

100% of respondents reported benefit with BeOpen Use Case, with **40% citing** a **significant impact** and **20% exceptional.**

EXPANDED DATASET AVAILABILITY

New datasets made available

55%

of respondents said the project added **more than 5 new datasets** relevant to flood response and urban resilience.

HIGH PERCEIVED EFFECTIVENESS

Greater perceived effectiveness of open data initiatives post-project

80%

rated solutions as "moderately" or "**extremely effective**" in managing flood-related risks.

Pilot Porto – New approach after adopting BeOpen?

- **Reinforcement of Porto's Digital Transition and Innovation Strategy**, particularly with regard to **data-driven decision-making** within our Integrated Management Center.

- **Replicability potential in Porto**:
  65% of respondents consider the BeOpen framework and the developed Digital Services to be **"Highly Replicable"** within the city of Porto.

The future:

- **Exploring new open calls** related to **Digital Twin technologies**, with continued focus on the **urban flooding** thematic area.
- **Interest among stakeholders in leveraging the IAT** and exploring a possible integration into our **cataloguing system:** automating the classification of HVD and their labeling in the new Porto Open Data Portal, and subsequently in the European Open Data Portal.

Thank you!

Visit our **website** for updated information
and follow our **social media** channels!

BeOpen has received funding from Digital Europe Programme
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CONSORTIUM PARTNERS

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