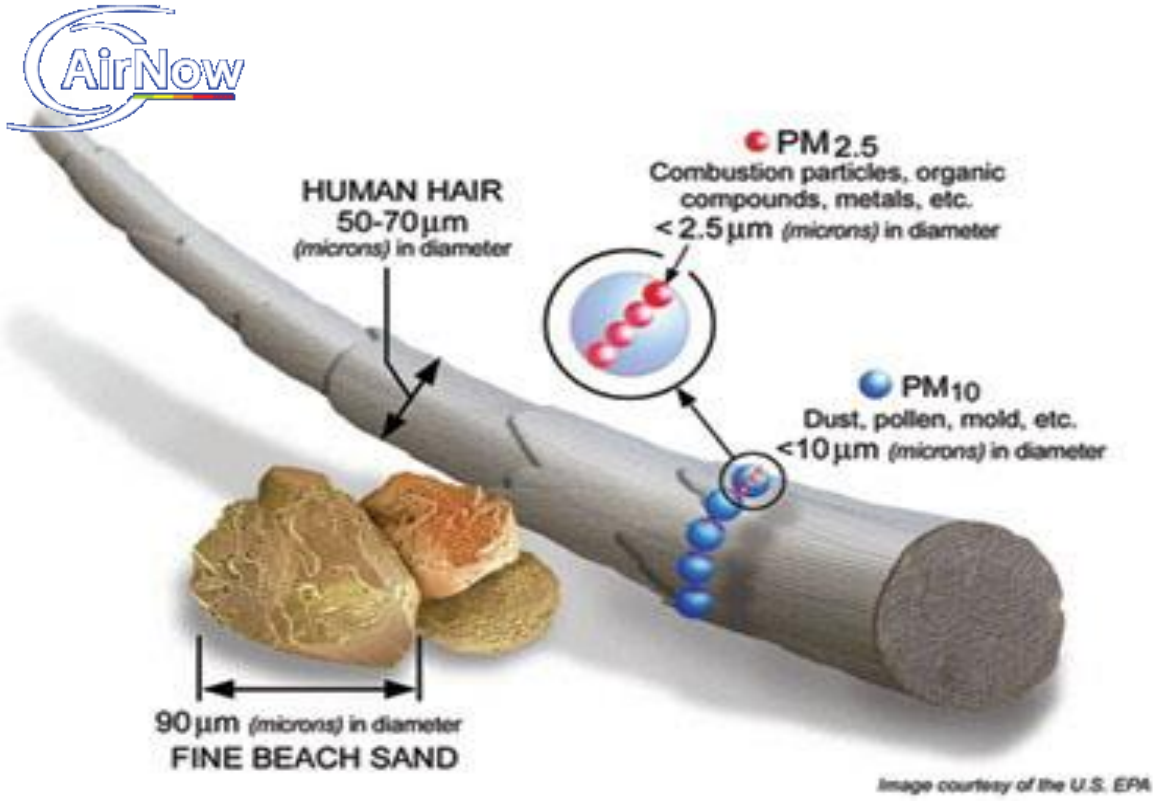
Rete di sensori IoT per il monitoraggio della qualità dell'aria

www.airbreakferrara.net

Milano, 29/03/2023

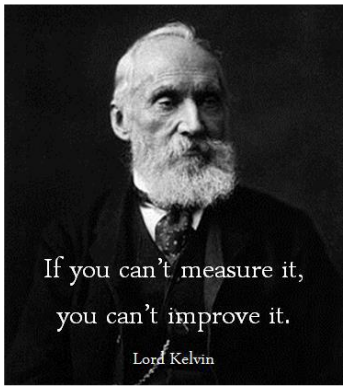
Dott. Chim. Ivano Battaglia

Un Capello, la Sabbia e … le microParticelle PM 10-2.5



Misurare…per Migliorare

←→

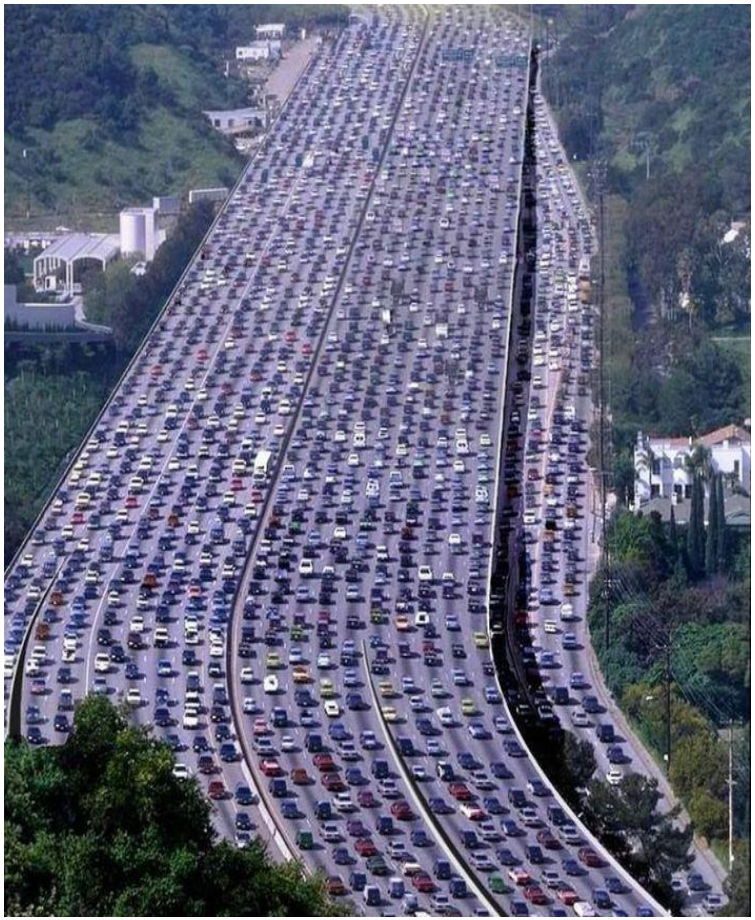


1 nanometro (10-9 mt)

1 mt

Inquinamento atmosferico

- **PM 10**
- **PM 2.5**
- VOC
- NOx
- SOx
- HCHO
- **ODORI**



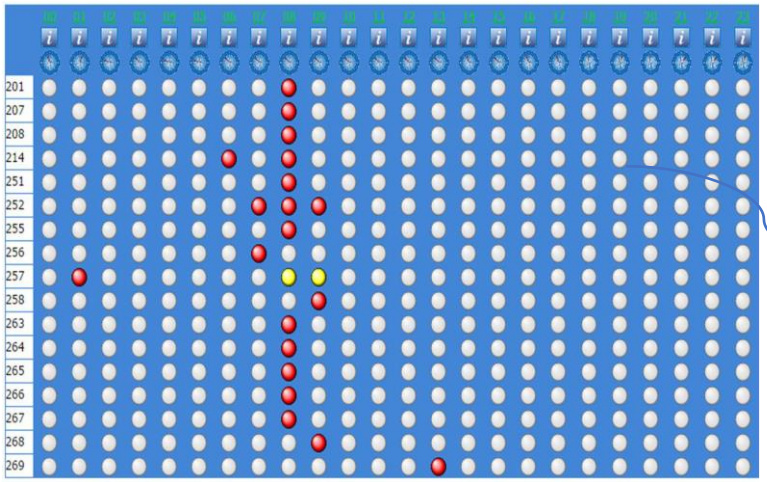
Air-Break

L'*attenzione* di chi opera nel settore dell'A.Q. si sta focalizzando sempre di più verso ….

- strumentazione di semplice utilizzo
- tempi di risposta estremamente veloci
- Elevata accuratezza delle misure
- Gestione remota del dato

Article Int. J. Environ. Res. Public Health 2016,

Automated Collection of Real-Time Alerts of Citizens as a Useful Tool to Continuously Monitor Malodorous Emissions



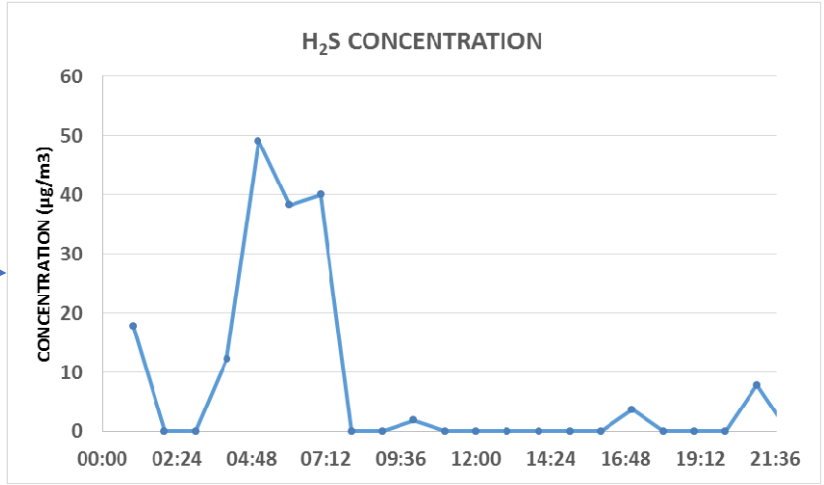


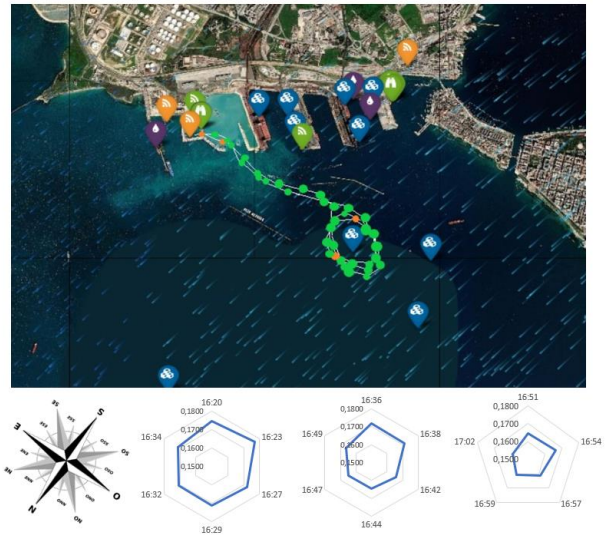
Figure 7. (**a**) Synoptic hourly visualization of complaints recorded by Odortel® on 1 August (each row refers to the annoyed receptor and each column indicates each hour of the day); (**b**) Analytical responses of H_2S concentrations, recorded on 1 August .

CHEMICAL ENGINEERING TRANSACTIONS

VOL. 82, 2020

IMPROVEMENT OF SENSOR TECHNOLOGY FOR MONITORING VOCs IN HARBOUR AND MARITIME AREAS: USE CASE AND FIRST FINDNINGS

Fugitive emissions of Volatile Organic Compounds (VOCs) resulting from industrial sources (e.g. storage tanks, gas pipelines or exhausted areas) are often of great concerns due to the release of unpleasant odors, irrespective if there is, or is not, a potential health impact. In this regard, trends of total VOCs are useful to detect the release of organic substances into the atmosphere for correlating them with potential odor harassments. **Sensors based on photoionization principle (PID,** Ion Science) have been successfully tested yet for *continuous monitoring* of the volatile organic compounds in ambient air: **at the fence of productive plants; close to industrial factories or urban settlements.** PID sensor has already proofed (University of Bari) for providing accurate data with detectable levels in the order of ppb. Even in presence of a high humidity.



2. Materials and methods

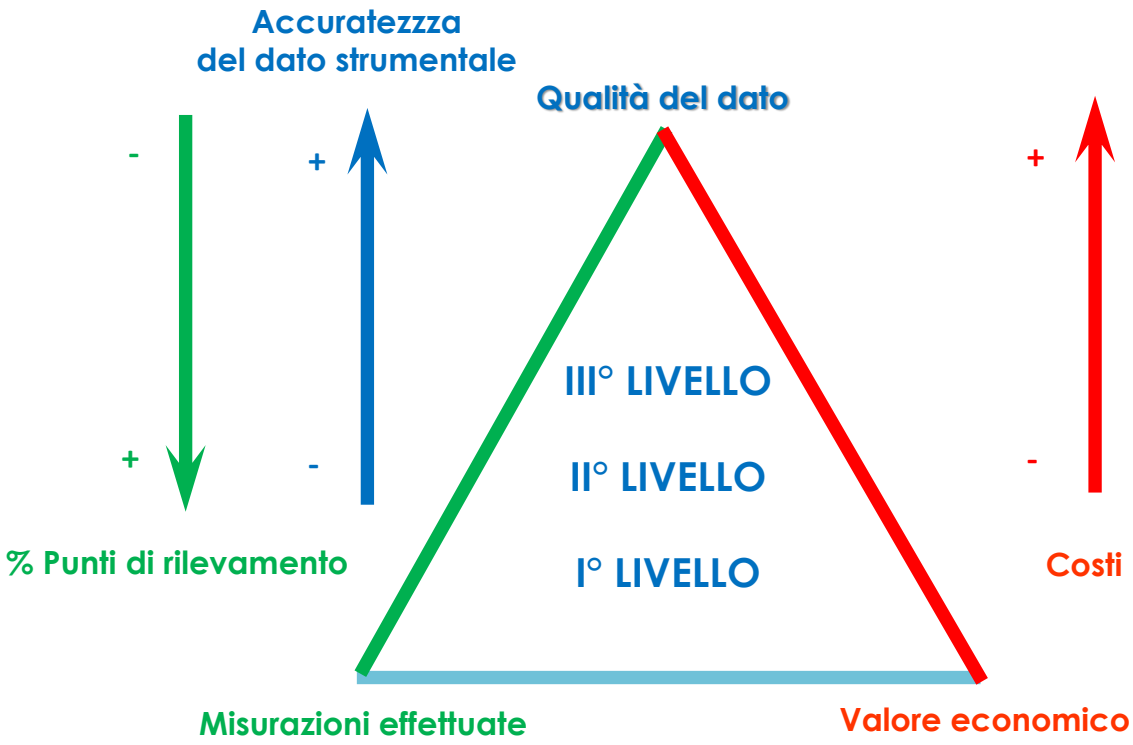
The study concerned a sanitary landfill for non-hazardous waste distant 3 km from Statte, South Italy (Figure1a). The sanitary landfill, active since 2004, occupies a former limestone quarry, with 213.000 m2 surface and 37 m average depth below ground level for an overall capacity of 6.2 M m3 of waste.

Figure 1a: territorial framework (by Google)

Figure 1b: sanitary landfill and monitoring points

MONITORAGGIO AQ

Indagine differenziata a seconda della finalità



MONITORAGGIO AQ

Indagine differenziata a seconda della finalità

Riferibilità

Misurazioni effettuate

Qualità del dato

…

III° LIVELLO

II° LIVELLO

I° LIVELLO

Valore economico

Numerosità

Qualità del dato

- **UNI** - Ente Nazionale Italiano di Unificazione –

  associazione privata senza scopo di lucro , riconosciuta dallo Stato e dall'Unione Europea. Elabora, approva e pubblica le **Norme Tecniche** volontarie – "**Norme UNI**" – per i settori industriali, commerciali e del terziario (tranne in quelli elettrico ed elettrotecnico).

  Le principali tipologie di soci UNI sono Imprese, Professionisti, Associazioni, Enti pubblici, Centri di ricerca e Istituti .

- **UNI** rappresenta l'Italia presso le **Organizzazioni di Normazione**

  - **CEN** (Comunità Europea) e

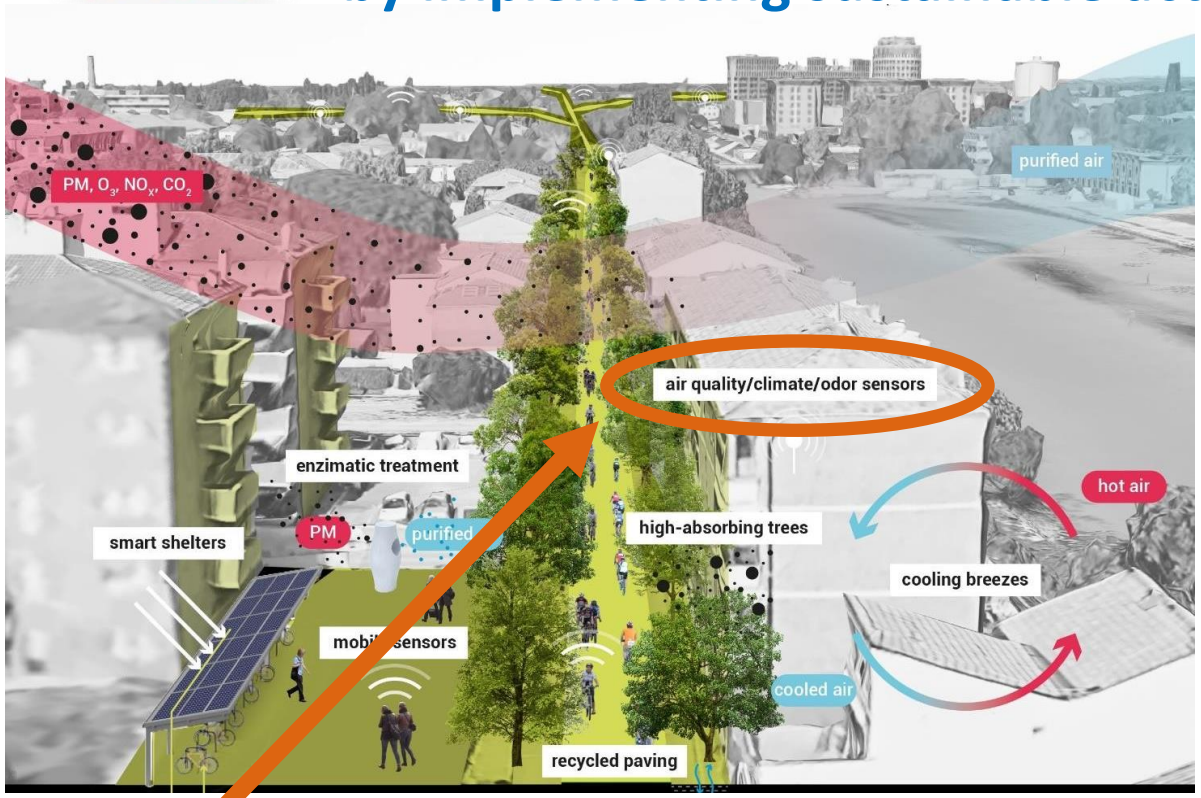
  - **ISO** (Int.Stand.Organ.,Mondiale).

'..IT IS NOT A MATTER OF OVERREACTION IT IS ABOUT QUALITY OF LIFE..'

Progetto UIA AIR BREAK Ferrara

- UIA 5th-Call 2019

Ferrara Municipality project to improve air quality by implementing sustainable actions in town.



- **New 24/7 smart AQ and Odor monitoring network**
- **Clean commuting and urban planning solutions**
- **New smart bike track**
- **Restructuring of strategic points of the current cycle network**
- **Integration of solutions to mitigate atmospheric pollution**
- **Solution for active citizen involvement**

Reference Industrial Air Quality Stations (Local EPA)

Air Quality Monitoring Network

Reference Public Air Quality Stations (L

Scale = 1 : 97K

EPSG:3857) (WGS84 / Pseudo - Mercator)

Alcune foto delle installazioni

X Giornata sulla Modellistica in ARIA(NET)

Rete di monitoraggio Smart della Qualità dell'aria

Air-Break
Co-producing healthy clean commuting air spots in town

Sistemi Multi-Sensore

OdorPrep APP

OdorAlert
(info Air Quality and Odors)

Dati in tempo reale aggregate su **base oraria**, relative a:

- PM10 e PM2.5
- NO2
- O3
- VOC
- Temperature
- Relative humidity

Dott. Chim. Ivano Battaglia

Air-Break

Smart air quality monitoring network

14 Multi-Sensor Systems

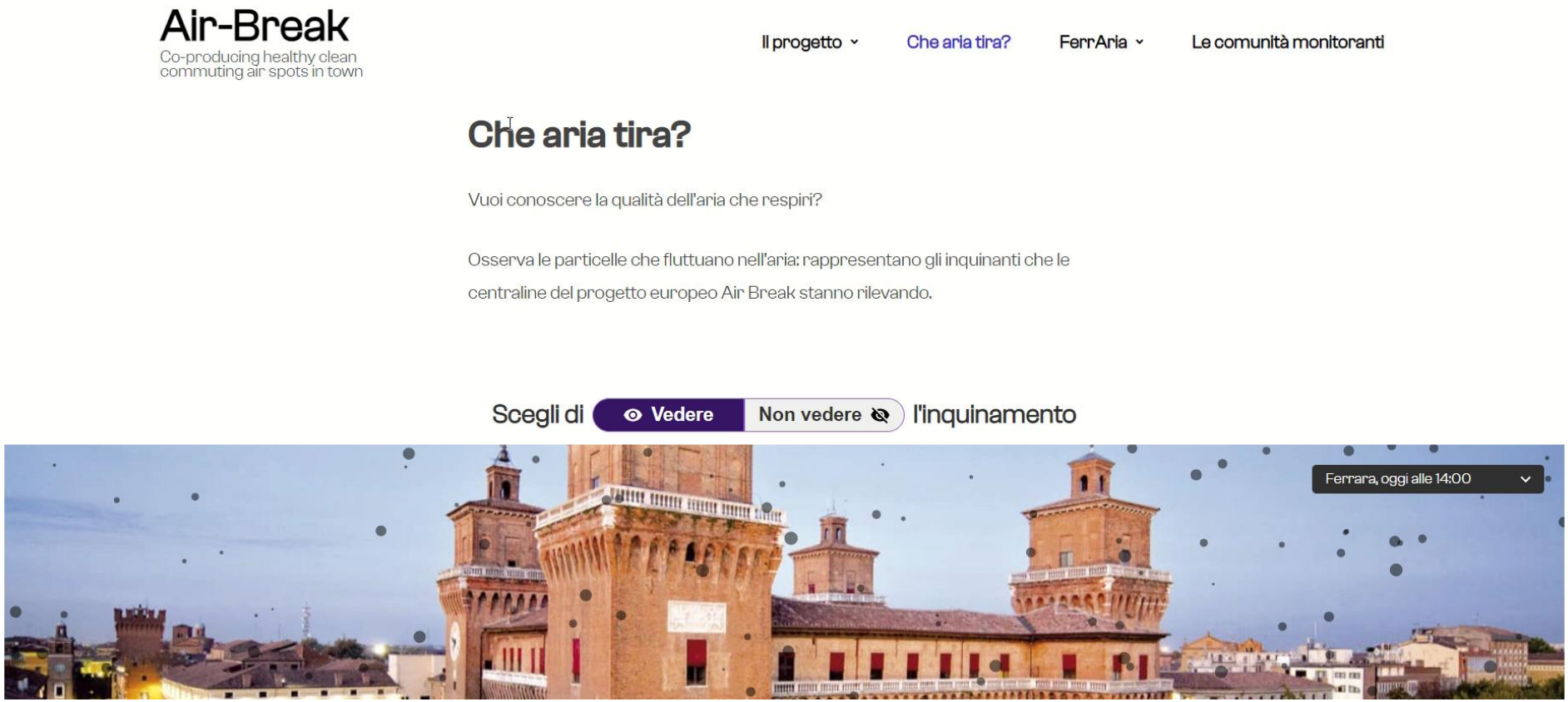
Real-time data aggregated on an hourly basis, relating to:

- PM10 e PM2.5
- NO2
- O3
- CO
- VOC
- Temperature
- Relative humidity
- Atm. Pressure

… a long-term study (years) is being conducted together with Italian National Research Centre to evaluate and validate the performance of the "low-cost sensors" with respect to the reference sensors of the Control Authority (ARPA) located at 3 points in the city …

Air-Break

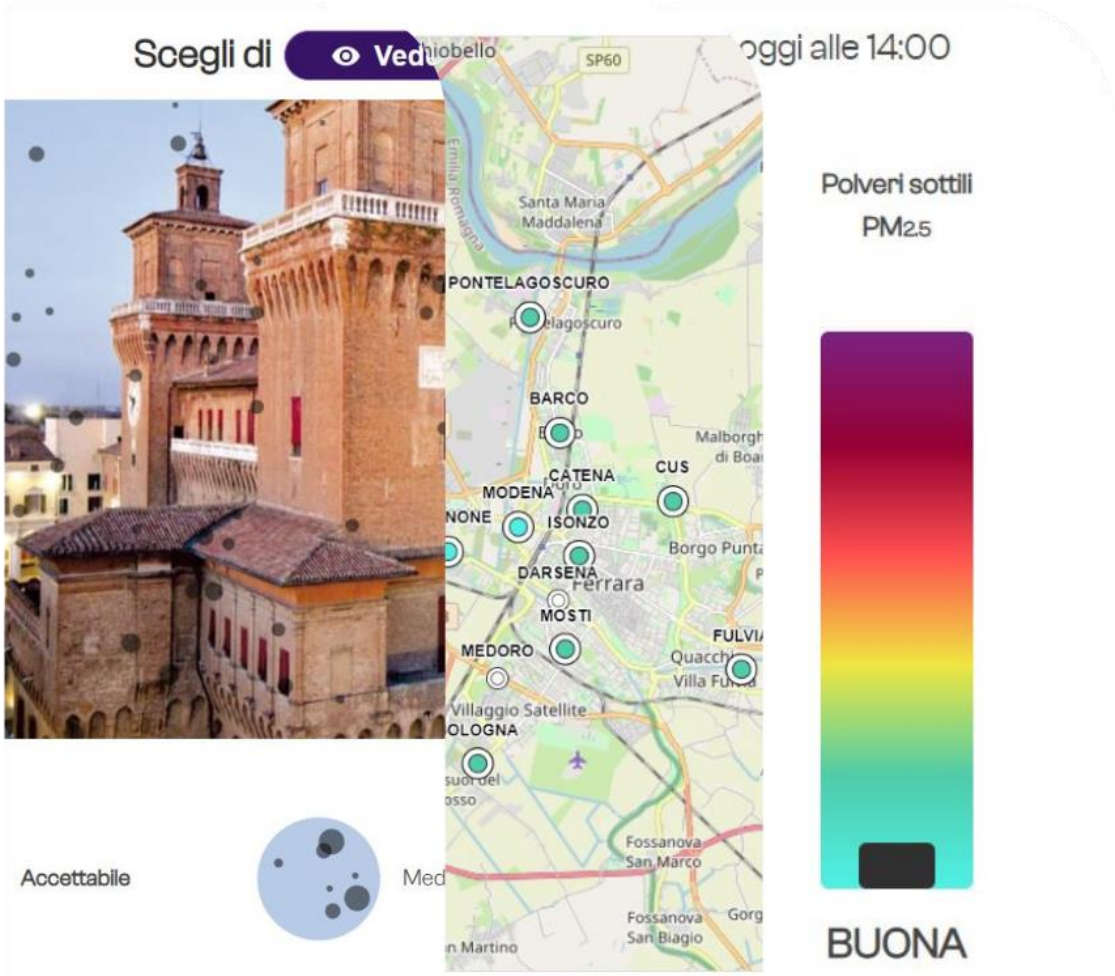
La restituzione dei dati sulla qualità dell'aria ai ferraresi



Fonte: airbreakferrara.net - Che aria Tira?

Dott. Chim. Ivano Battaglia

Un indice della Qualità dell'aria

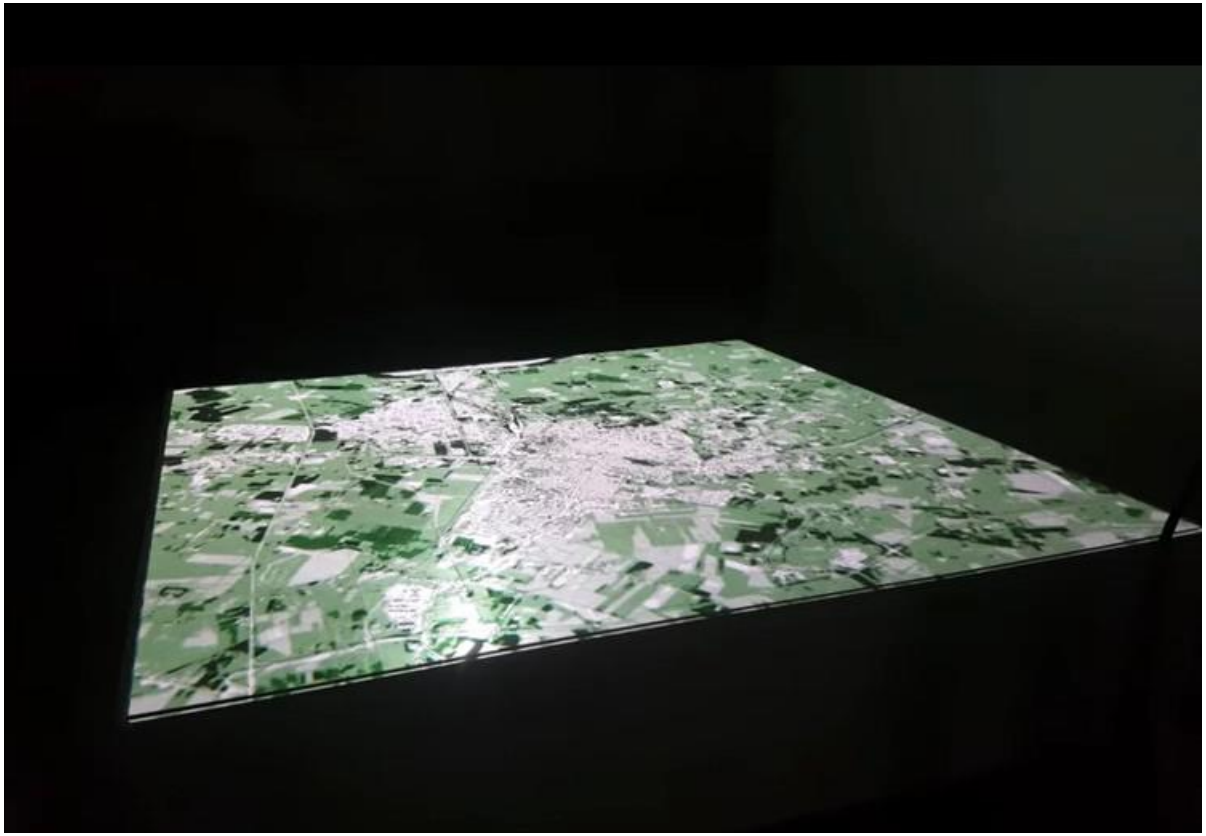


Sintetico **Zonale** **Parametrico**

La restituzione dei dati orari sulla qualità dell'aria a Ferrara

Fonte: airbreakferrara.net - Che aria Tira?

Dataset eterogenei per lo studio degli impatti delle azioni Air Break



Elaborazione di dati da fonti eterogenee per misurare gli impatti delle azioni AIR BREAK

Fonte: airbreakferrara.net - Che aria Tira?

Dott. Chim. Ivano Battaglia

What's next?

EDIAQI!

Air-Break

7/2020 — 3 Yrs — 12/2023

EDIAQI Evidence Driven Indoor Air Quality Improvement

12/2022 — 4 Yrs — 12/2026

Outdoor and Indoor air quality monitoring network in Ferrara

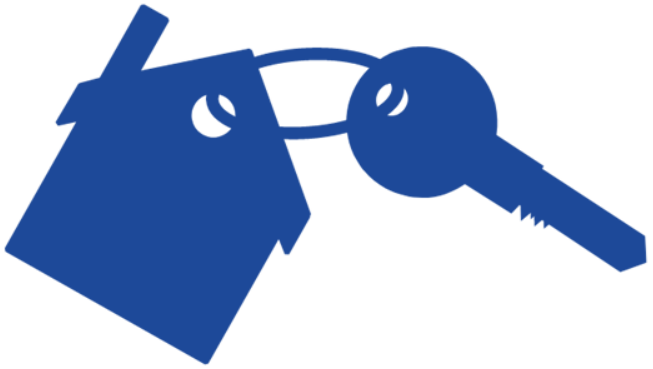
COMUNE DI FERRARA Air-Break

EDIAQI Ferrara Pilot – Main Target

Schools

Offices

Entertainment



Living spaces

Smart indoor air quality monitoring network

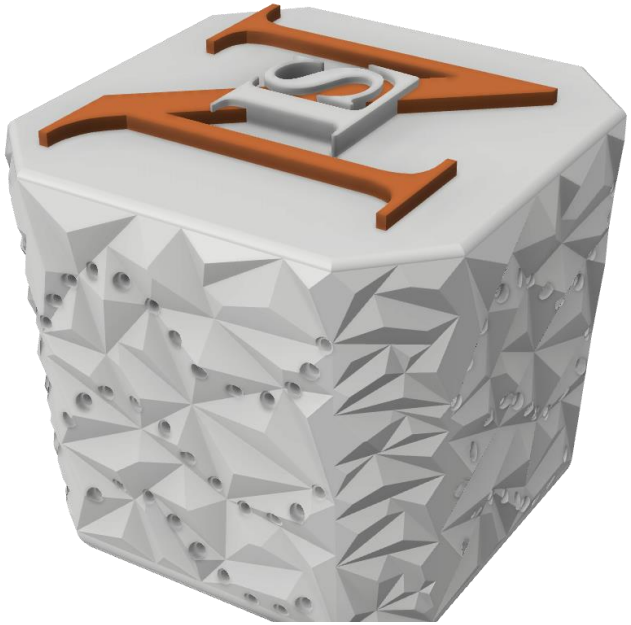


Image for illustrative purposes

50 Multi-Sensor Systems

Real-time data aggregated on an hourly basis, relating to:

- PM10
- PM2.5
- NO2
- O3
- CO
- VOCs
- VOCs (Aromatics)
- Temperature
- Relative humidity
- Atm. Pressure

... the long-term (years) study of "low-cost sensors" versus reference sensors will also continue by observing their performance in indoor spaces ...

To be continued!

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