

ThermiAir

An Innovative Air Quality
Monitoring System for Airborne
Particulate Matter in Thermi,
Greece

Geospatial Enabling Technologies (GET)

Panagiotis Symeonidis, Pantelis Mitropoulos,
Simeon Taskaris, **Theodoros Vakkas***

Laboratory of Atmospheric Physics University
of Patras

Vasileios Salamalikis, Georgios Kosmopoulos,
Andreas Kazantzidis

Municipality of Thermi

Eleni Adamopoulou, Dimitrios Karakirios

Outline



Objectives



Network



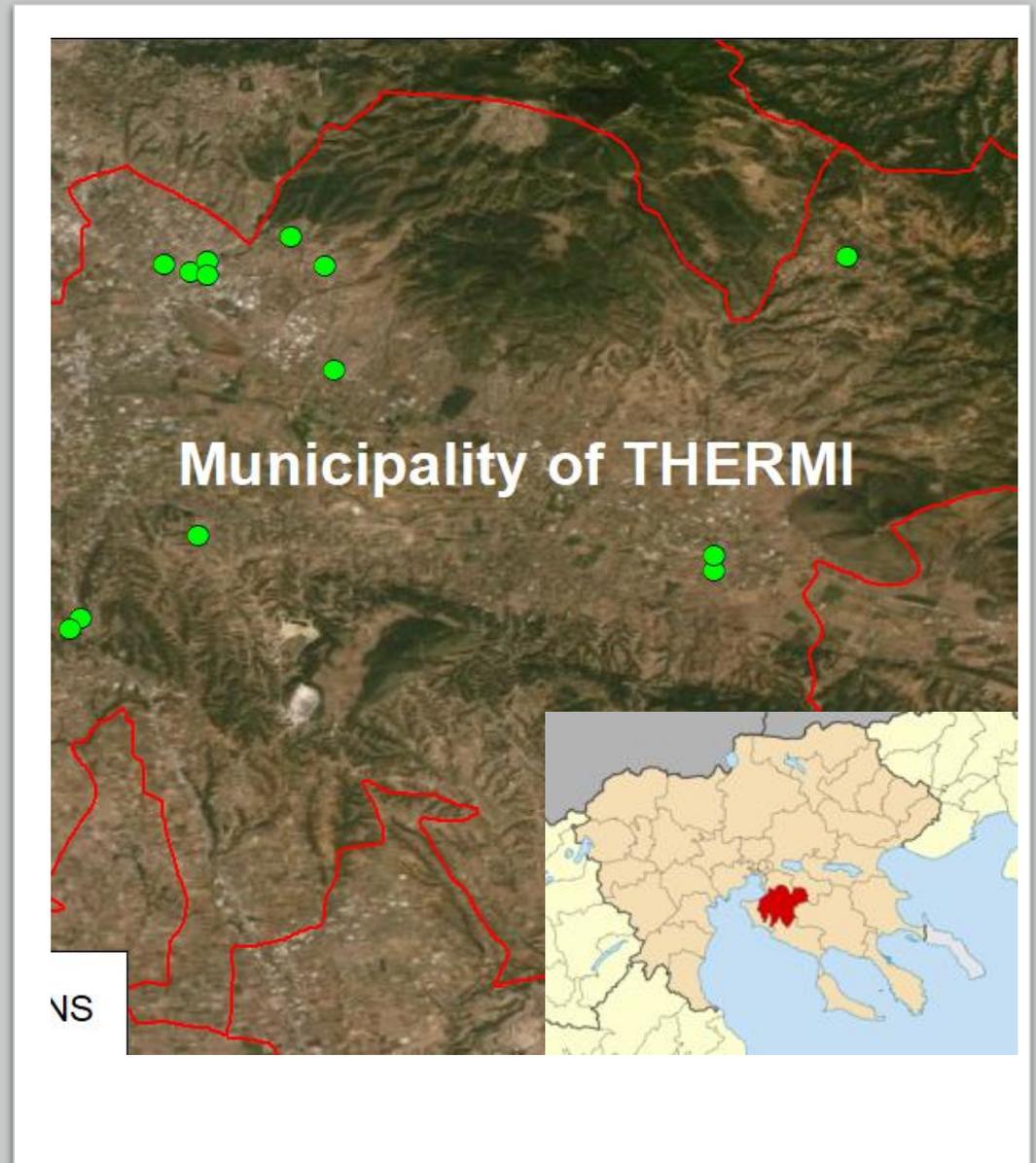
Components/Technology



Conclusions

Objectives

- Monitor Air Quality - Municipality of Thermi
 - City block/ Neighborhood
- Inform/Protect vulnerable population groups
- Support decision making
- Actionable information



Sensor Network

📁 Study area: Municipality of Thermi

📁 25 **low cost** sensors

📁 Observation

📁 PM1 (1 μ m)

📁 PM2.5 (2.5 μ m)

📁 PM10 (<10 μ m)

📁 AQI

📁 Calibrated values

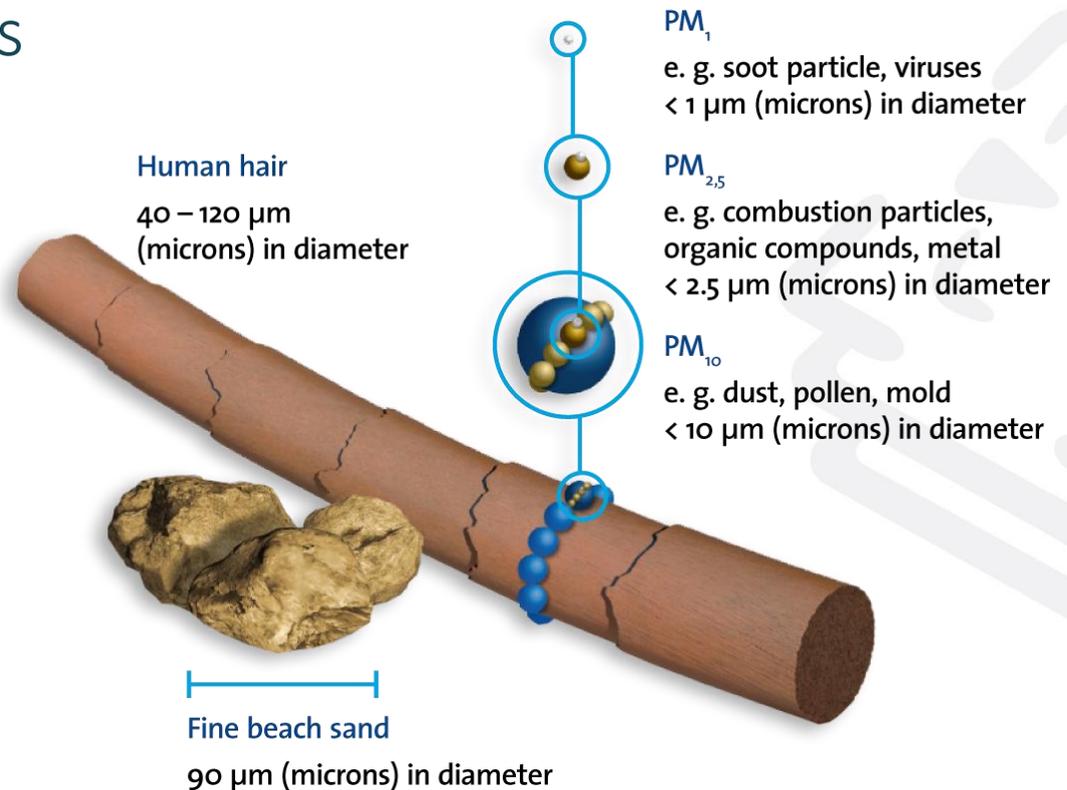
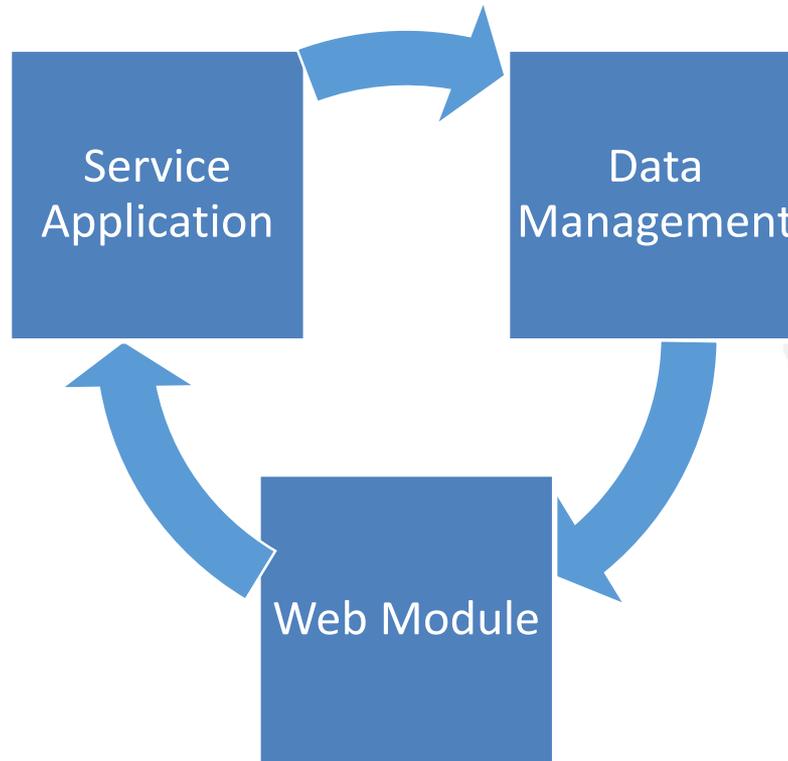


Illustration Of Pm1, Pm2,5 Und Pm10 Particle Size - Beispiel Mikrometer

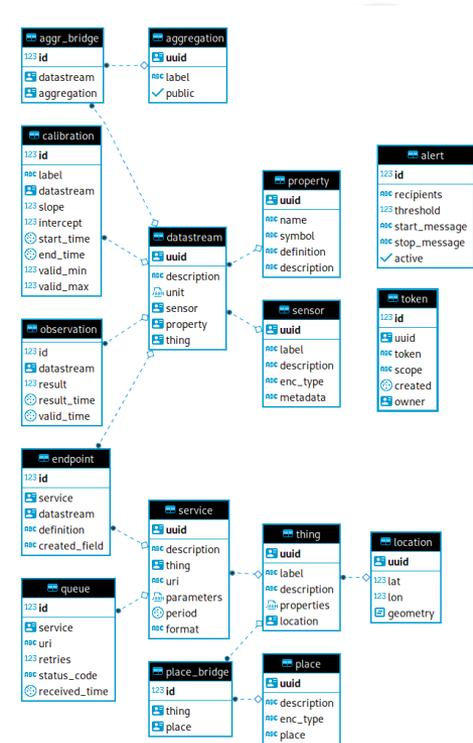
Components

-  Database
-  Services/API
-  Web Interface



Components - Database

- 📁 IOT modular schema on PostgreSQL
- 📁 ISO/OGC Observation and Measurement (O&M) model [OGC and ISO 19156:2011]
 - 📁 Thing has location and supports multiple datastreams | 1 thing: N sensors
 - 📁 Sensor -> results whose value is estimate of Observed Property
 - 📁 Datastream = collection of Observations
- 📁 Timeseries indexed by TimeScaleDB for performance



Components - Services

Consume sensor data

-  5' observation interval

-  30' system update

Expose data through RESTful API

-  Custom

-  Thing and location properties

-  PHP 7.3

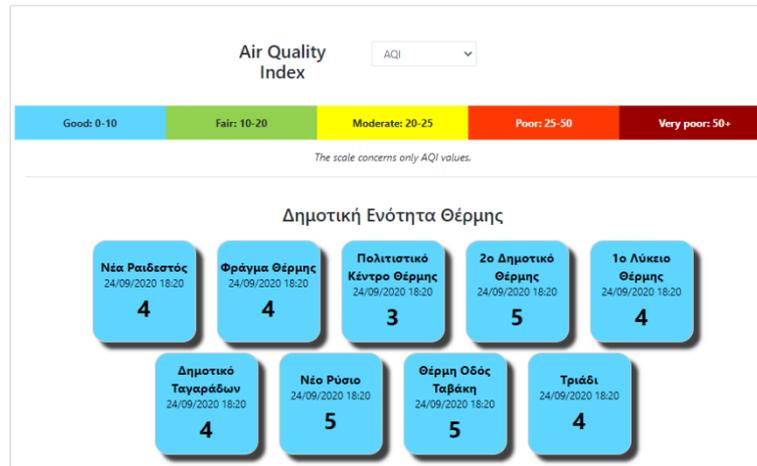
-  Support for queries

 -  Time window

 -  Aggregated values for predefined time intervals

 -  Stats

User Management



Components

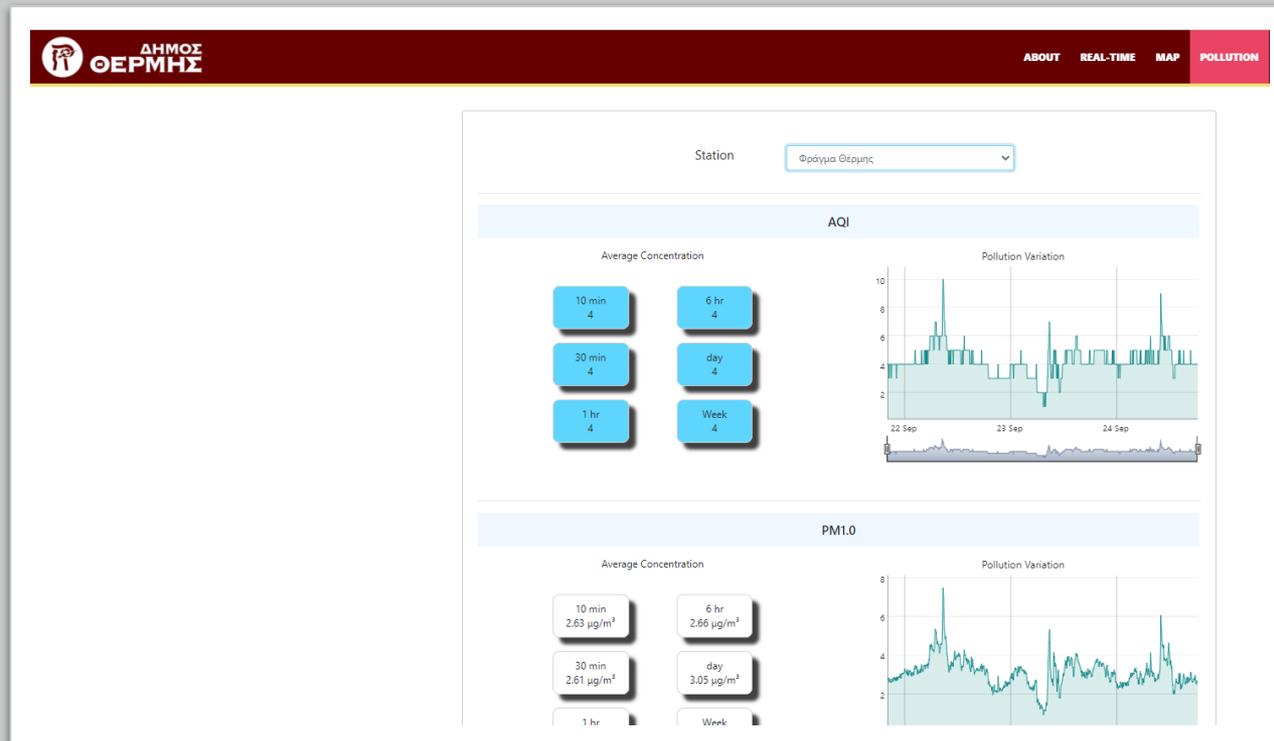
– Web App

• Real time dashboard

- Overview of the air quality levels
 - Air Quality Index (AQI)
 - raw concentrations
- AQI grouped in 5 categories according to health impacts (from good to very bad) and visualized with different colors

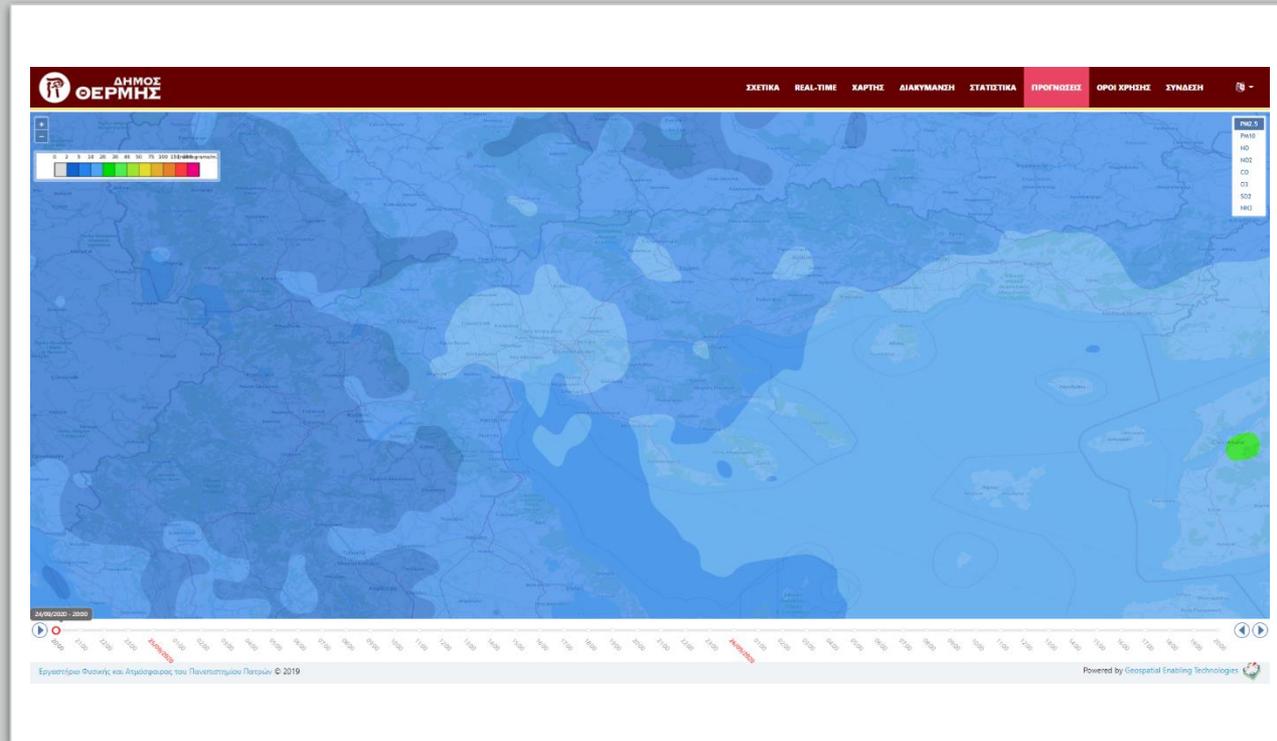
Components – Web App

- Detailed station data
 - Statistics
 - 10 minutes, 30 minutes, 1 hour, 6 hours, 1 day and 1 week averages of AQI and PM*
 - Statistics



Components – Web App

- Air Quality forecast
 - 3-day forecast
 - Copernicus Atmosphere Modelling Service – CAMS
 - PM 2.5, PM 10, NO, NO2, CO, O3, SO2, and NH3



Conclusions

- 📊 Air pollution information at city block/ neighborhood level
- 📊 Low cost IoT devices act as enablers
- 📊 Standard methodology for data validation should be applied
- 📊 In-situ calibration needed to ensure the requested data quality

<http://app.thermiair.gr/>

Thank you for your attention!

Contact with us

Geospatial Enabling Technologies	Laboratory of Atmospheric Physics University of Patras,	Municipality of Thermi
Panagiotis Symeonidis, Pantelis Mitropoulos, Simeon Taskaris, Theodoros Vakkas	Vasileios Salamalikis, Georgios Kosmopoulos, Andreas Kazantzidis	Eleni Adamopoulou, Dimitrios Karakirios
https://getmap.eu 43 Poseidonos Av. & Chr. Smyrnis, 18344 Moschato, Athens, Greece	https://www.atmosphere-upatras.gr/ University Campus, 26500, Patras, Greece	http://www.thermi.gov.gr/ 1 Dimokratias Str, 57001, Thermi, Thessaloniki, Greece