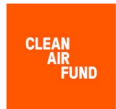




Accessing Open Air Quality Data

Colleen Rosales, Ph.D.
Strategic Partnerships Director, OpenAQ

*"By providing universal access to air quality data,
OpenAQ empowers a global community of changemakers to solve air inequality."*



Air Quality Data Challenges

- **Difficult to access** (buried in a website, not machine-readable)
- **Shared only temporarily**
- **Not interoperable** – disparate formats, lack of standardization
 - JSON
 - FTP
 - Web pages
 - XML
- **Lacking contextualizing metadata**

Central Scotland

Monitoring site	Running 8 Hour mean Ozone (ppm)	Hourly mean Nitrogen dioxide (ppm)	Max 15 min mean Sulphur dioxide (ppm)	Running 24 Hour mean Particulate (ppm)	Running 24 Hour mean Particulate (ppm)	Last updated
Auchincloss Moss Timeseries Graph	45 (2 Low)	n/m	n/m	0 (1 Low)	6 (1 Low)	23/09/2015 21:00:00
Bush Estate Timeseries Graph	51 (2 Low)	3 (1 Low)	n/m	n/m	n/m	23/09/2015 21:00:00
Dumbarton Roadside Timeseries Graph	n/m	4 (1 Low)	n/m	n/m	n/m	23/09/2015 21:00:00
Edinburgh St Leonards Timeseries Graph	29 (1 Low)	15 (1 Low)	6 (1 Low)	6 (1 Low)	6 (1 Low)	23/09/2015 21:00:00
Glasgow Great Western Road Timeseries Graph	n/m	19 (1 Low)	n/m	n/m	n/m	23/09/2015 21:00:00



Pollutants	Ozone	Ozone	Nitrogen dioxide	Nitrogen dioxide	Carbon monoxide	Sulphur dioxide	Particulate matter	Particulate matter
Averaging Periods	1-hour average	rolling 1-hour average	1-hour average	rolling 1-hour average	1-hour average	rolling 1-hour average	24-hour average	rolling 24-hour average
Sydney East	2.9	2.3	0.4	0.09	0.1	13.7	2.6	10.3
Rozelle	2.9	2.2	0.4	0.03	0.2	0.0	10.4	10.3
Linfield	3.0	2.4	0.2	0.06	0.0	0.0	12.8	4.5
Chulora	3.0	2.4	0.5	0.06	0.2	0.0	12.8	4.5
Earlwood	2.8	2.3	0.3	0.06	0.0	0.0	10.3	3.7
Richmond	2.7	2.5	0.2	0.06	0.0	0.0	8.9	3.6
St Marys	3.0	2.3	0.0	0.04	0.0	0.0	9.1	10.3
Vineyard	3.1	2.3	0.1	0.06	0.0	0.0	10.3	10.3
Prospect	2.9	2.4	0.3	0.10	0.0	0.0	12.0	6.2
Bargo	2.9	2.9	0.0	0.04	0.0	0.0	7.2	9.6
Brighely	2.9	2.3	0.1	0.06	0.0	0.0	9.6	9.6
Camden	3.0	2.9	0.0	0.05	0.0	0.0	7.0	2.6
Campbelltown West	2.8	2.7	0.1	0.07	0.2	0.0	11.7	10.3
Liverpool	2.9	2.5	0.3	0.04	0.0	0.0	10.3	3.6
Oakdale	2.9	2.7	0.0	0.04	0.0	0.0	6.4	12.8
Wollongong	2.7	2.6	0.4	0.06	0.1	0.0	12.8	4.4
Kembla Grange	2.6	2.6	0.2	0.05	0.0	0.0	8.8	3.2
Albion Park 5th	2.8	2.9	0.0	0.04	0.0	0.0	8.7	2.4
Wollongong	2.8	2.9	0.0	0.04	0.0	0.0	9.0	4.1

Gobernación ICAP-MP10

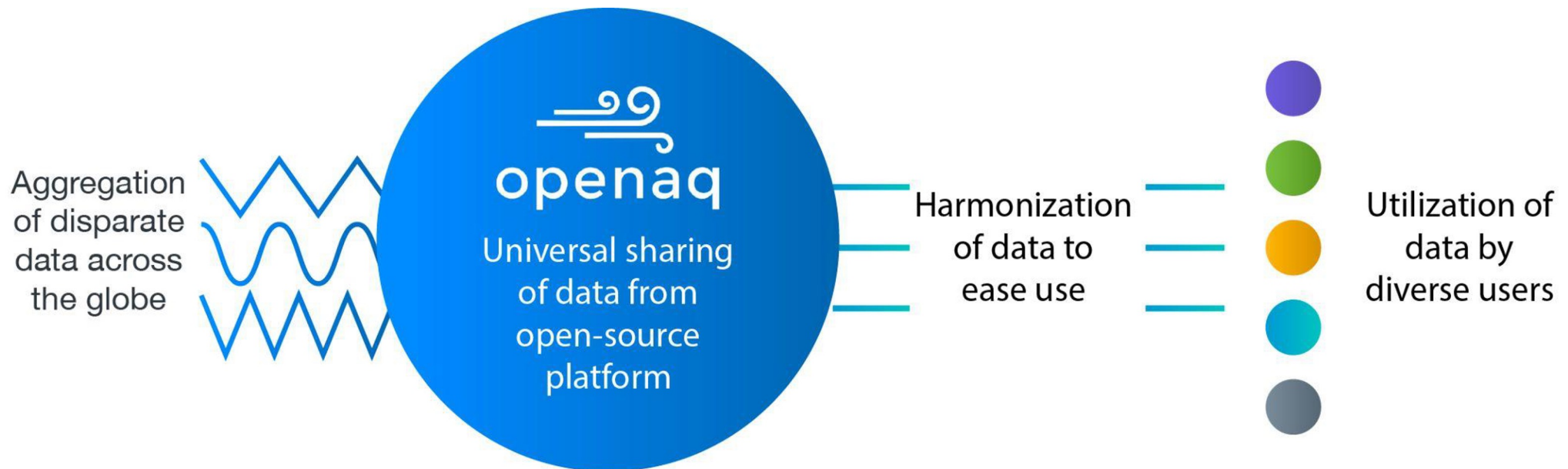
Calidad de Aire las últimas 24 horas:

Estación	MP 10	MP 2,5	SO ₂	CO	O ₃	NO ₂
Gobernación	10	2,5	-	-	-	-
Escuela E-10	10	2,5	-	-	-	-
Bomberos	-	-	-	-	-	-
Gendarmería	-	-	-	-	-	-

Presione sobre los botones para visualizar los niveles para los últimos tres días de cada estación-contaminante.

Click on the city name for more detailed information.	FORECAST		CURRENT AQI
printable summary	Wed Sep 23	Thu Sep 24	
Metropolitan Washington	33	38	44

OpenAQ harmonizes air quality data from disparate sources into one single format so that the public can more fully maximize the uses—and ultimate impact—of the data



About OpenAQ

"By providing universal access to air quality data, OpenAQ empowers a global community of changemakers to solve air inequality."



Chris Hagerbaumer, MPP
Executive Director



Russ Biggs
Director of Technology



Colleen Rosales, Ph.D.
*Strategic Partnerships
Director*



Minh Nghiem
Applied Data Fellow



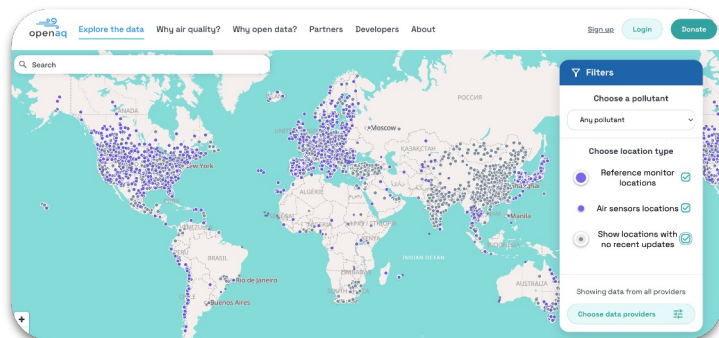
Matt Lane
*Marketing
communications volunteer*

- Founded in 2015 by Christa Hasenkopf, Atmospheric Chemist, and Joe Flasher, Software Engineer (see origin story at bit.ly/OpenAQ-Origin)
- U.S. 501(c)(3) non-profit organization as of 2018
- We celebrated our 10th anniversary on September 9, 2025: openaq.org/ten-years



OpenAQ Platform

The world's largest *open-source* air quality data aggregator and harmonizer



explore.openaq.org

Data Products

R client: github.com/openaq/openaq-r

Python SDK: python.openaq.org

Explorer: explore.openaq.org

explore.openaq.org/getting-started

>2 billion data points

>21,000 locations

139 countries

~14 new scientific & media
uses each month

●PM_{2.5}

●PM₁₀

●Sulfur Dioxide (SO₂)

●Nitrogen Dioxide (NO₂)

●Carbon Monoxide (CO)

●Black Carbon (BC)

●Ozone (O₃)

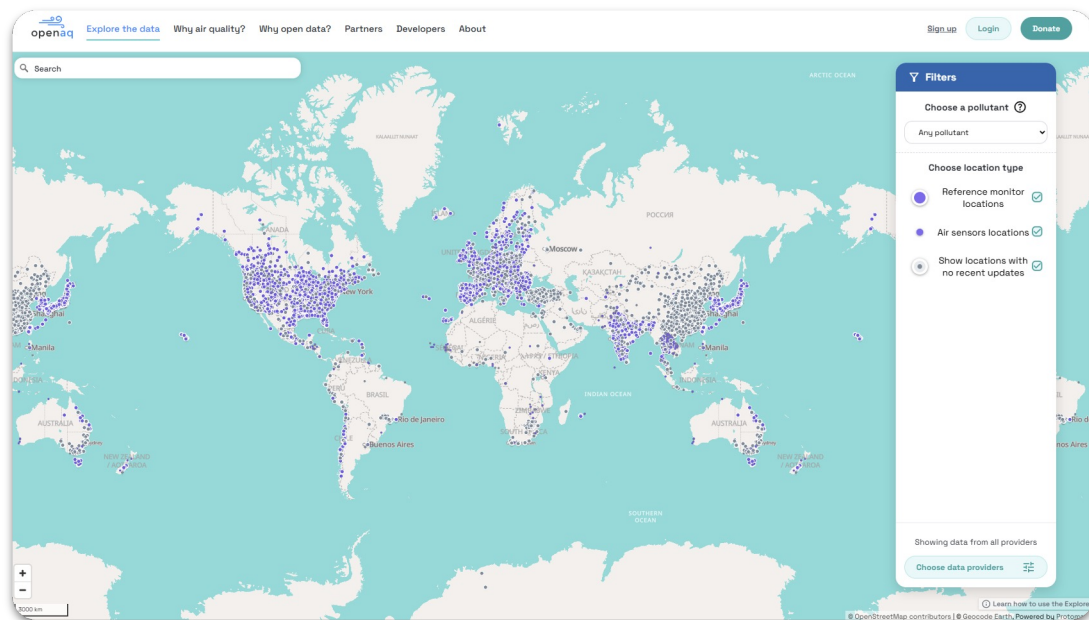
Data Sources

(ground-based instruments)

1. Reference monitors
2. Air sensors
("low-cost" sensors)

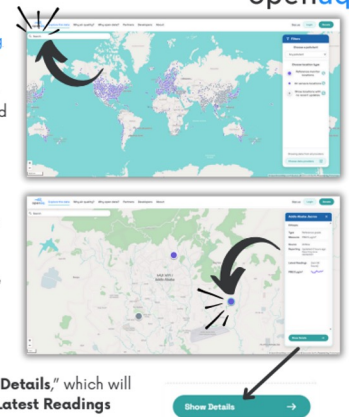
OpenAQ Explorer

 explore.openaq.org



Accessing air quality data in

- 1 Go to <https://explore.openaq.org>
- 2 On the Search panel on the upper left side, type **[location name]** and choose the location from the dropdown menu.
- 3 If there is open air quality data at that location, you will see one or more purple dots. Click on a dot to see basic information about the air monitor or sensor on the right-hand sidebar.
- 4 Within the sidebar, click on **"Show Details,"** which will bring you to a page that includes **Latest Readings** and **Patterns** graphs.
- 5 If you want to explore other monitoring locations elsewhere, go back to the map and pan out. Or start over (see #2), typing in a new location name.

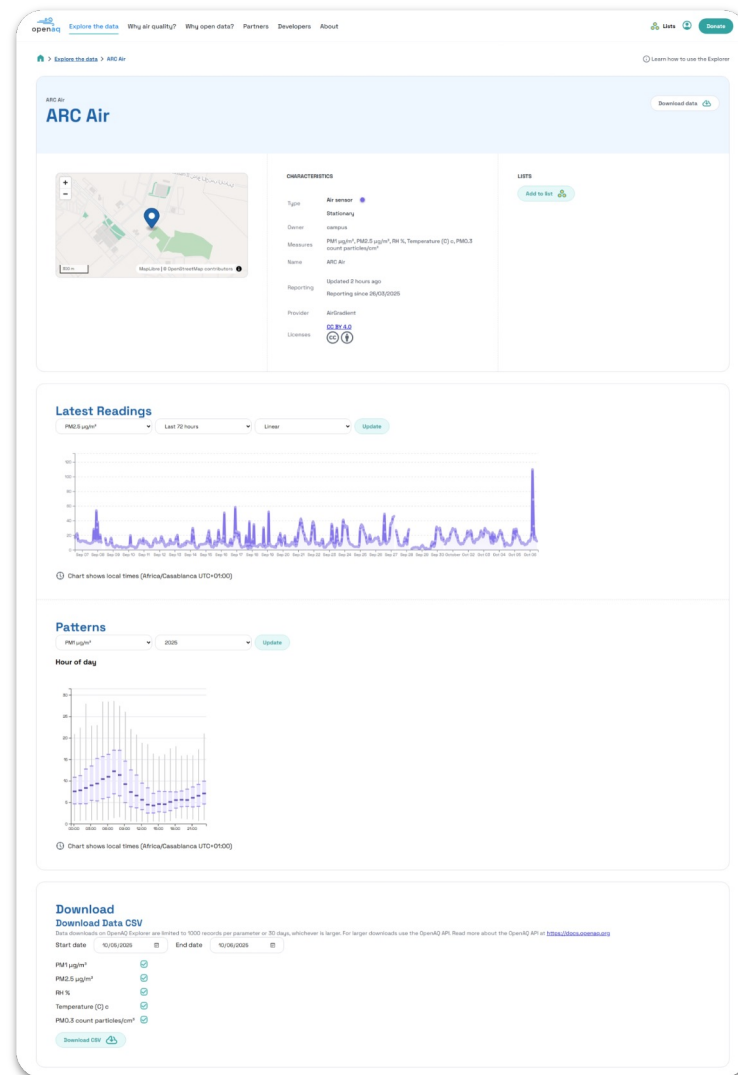
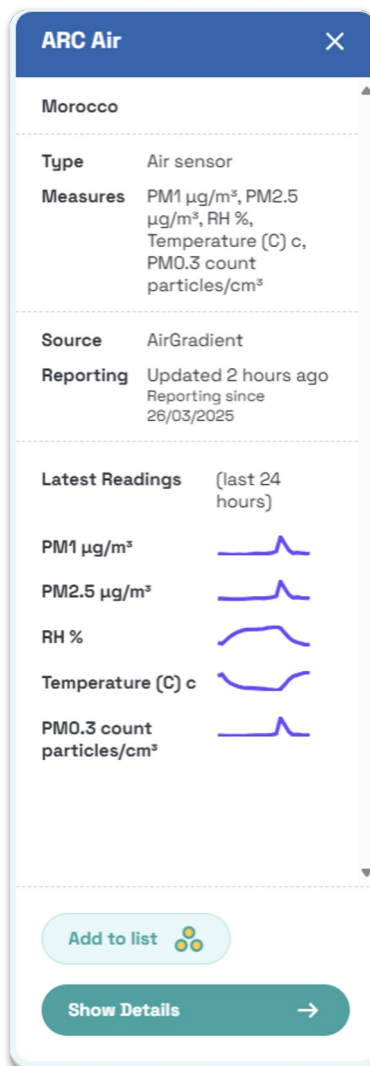


 If you start over, make sure to click both **"Reference monitor locations"** and **"Air sensor locations"** in the sidebar.

 You can also choose **"Show locations with no recent updates."**

 explore.openaq.org/getting-started

Getting to the Detail page



Diurnal plots

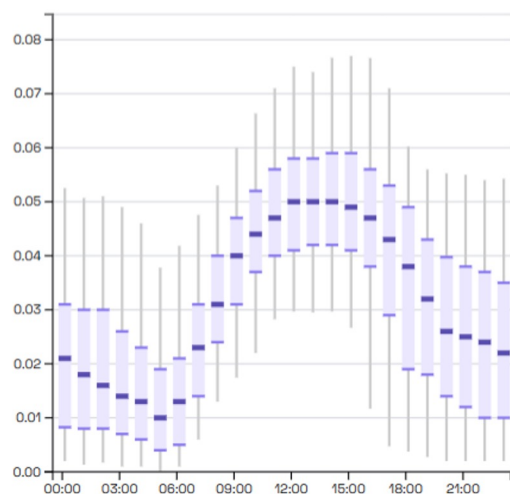
Q: Which air pollutants have a dependence on time, day, and season, and why?

Patterns

O₃ ppm

2023

Hour of day



Five-number summary

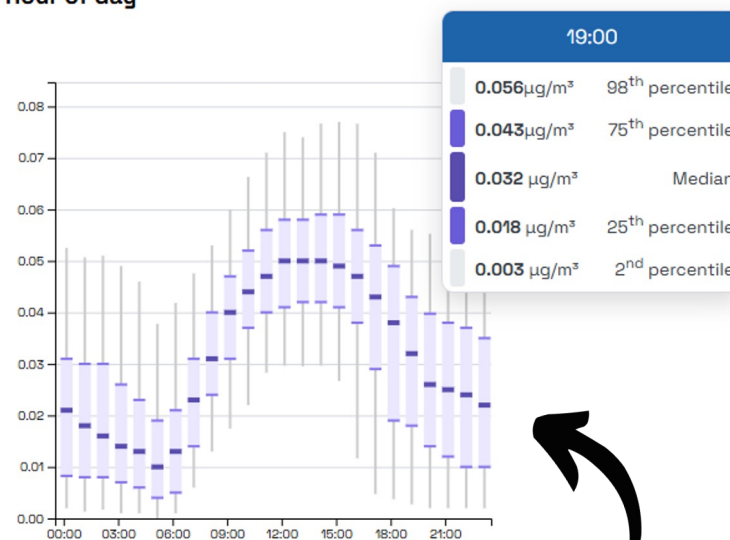
Patterns

O₃ ppm

2022

Update

Hour of day

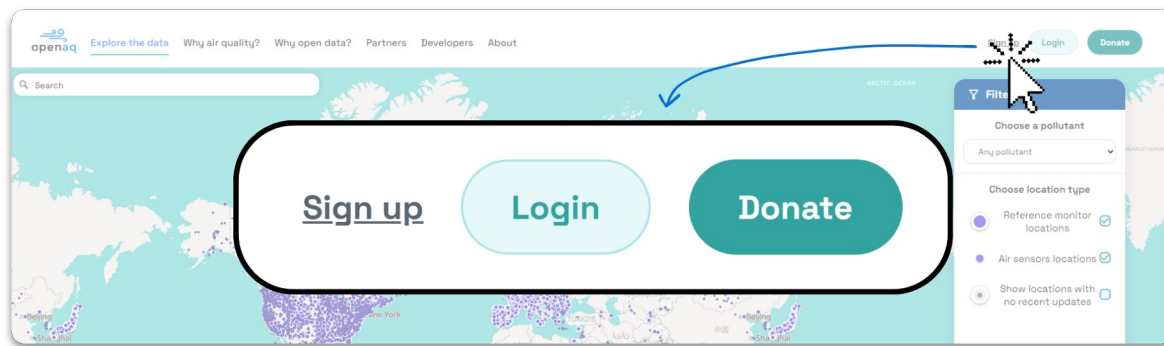


Q: What is the median O₃ concentration during a certain day/time in my location?

Download

sign up required

explore.openaq.org/register



Download

Download Data CSV

Data downloads on OpenAQ Explorer are limited to 1000 records per parameter or 30 days, whichever is larger. For larger downloads use the OpenAQ API. Read more about the OpenAQ API at <https://docs.openaq.org>

Start date End date

Temperature (F) ☒

NO₂ ppb ☒

PM1 $\mu\text{g}/\text{m}^3$ ☒

PM10 $\mu\text{g}/\text{m}^3$ ☒

PM2.5 $\mu\text{g}/\text{m}^3$ ☒

T c ☒

Download CSV 

**Limit at 1000 records or 30 days,
whichever results to a larger file**

**Open using any spreadsheet viewer (e.g., MS Excel, Google Sheets,
LibreOffice Calc) or you can also use any programming language**

OpenAQ API

 api.openaq.org

 docs.openaq.org

R client:

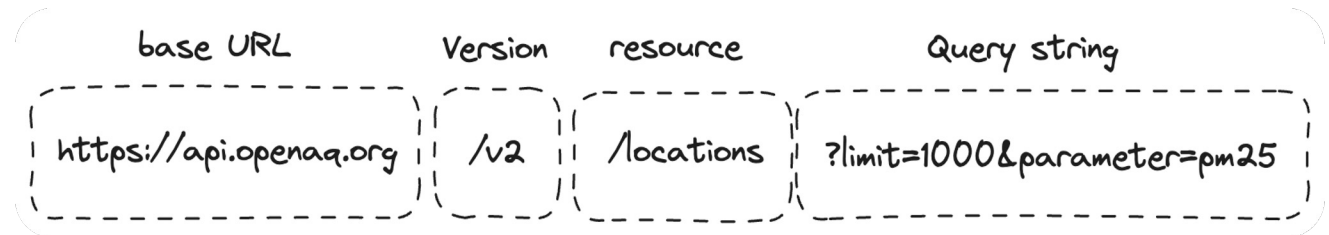
 openaq.github.io/openaq-r

Python SDK:

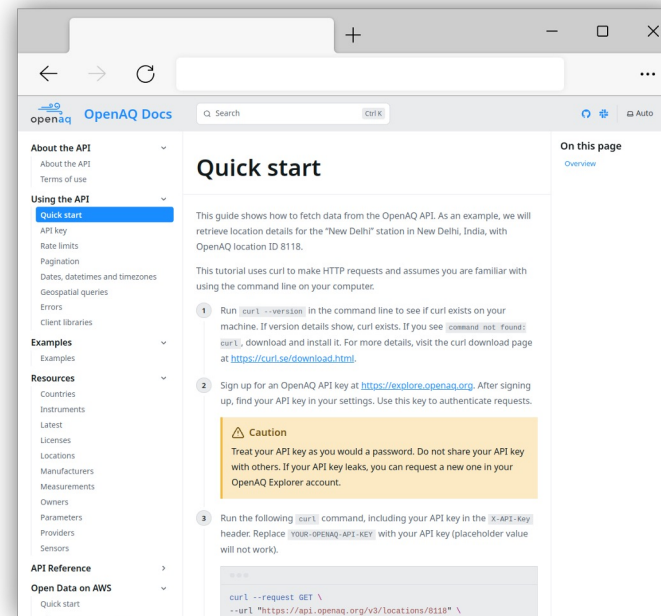
 python.openaq.org

Join Slack!

 link.openaq.org/joinslack



"Provide me a list of **locations** filtered to those that measure the **parameter PM_{2.5}** and **limit** the results to **1000** per page"

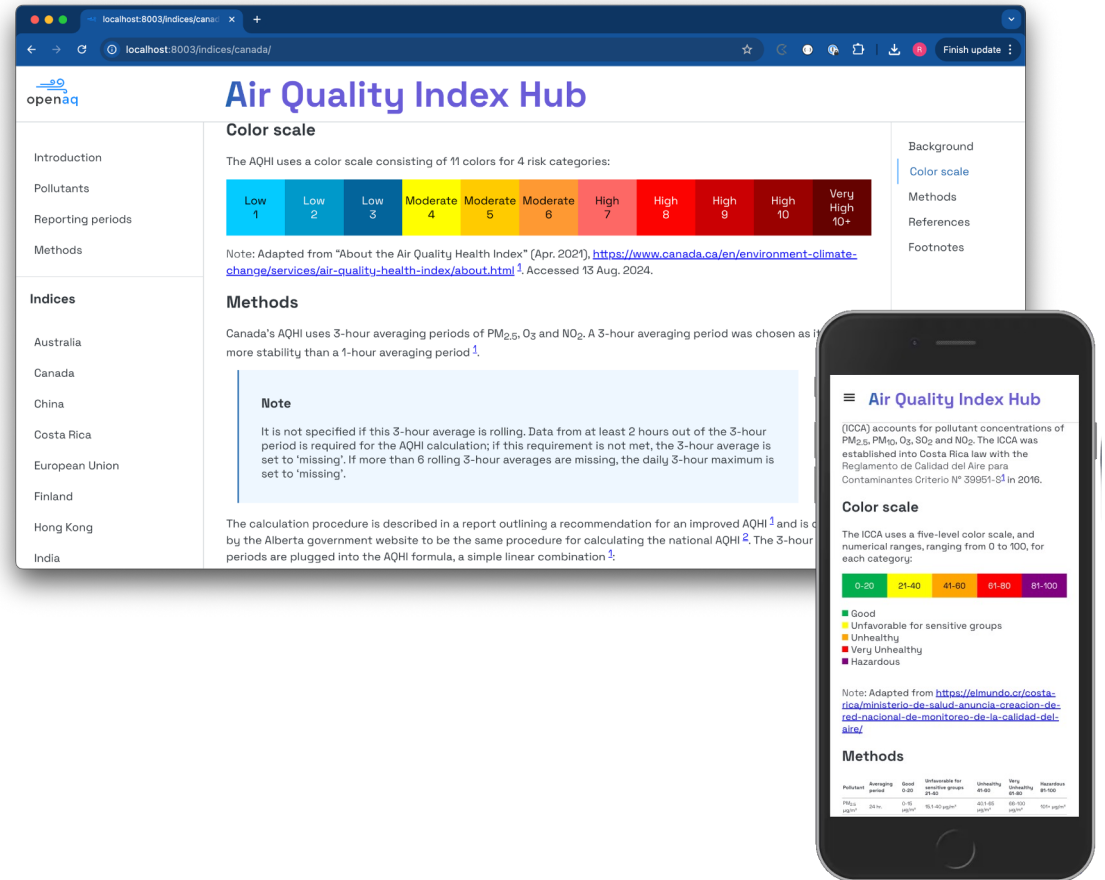




Documentation for air quality indices (AQI) in one convenient platform

Interactive calculator and comparison tool national and regional AQIs

(35 and counting as of October 2025)



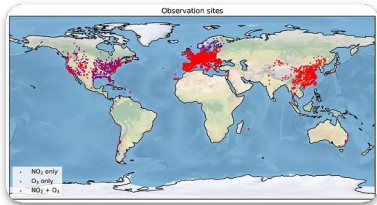
OpenAQ serves:

- scientists, researchers, analysts
- community advocates
- nonprofits, civil society orgs
- journalists, communicators, educators
- governments
- tech companies, entrepreneurs
- individuals

Data on OpenAQ are used to:



Use Cases

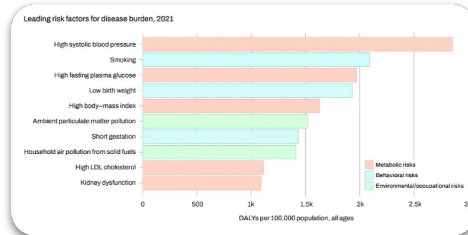


Global impact of COVID-19 restrictions on NO₂ and O₃

Keller et al, 2021.

Atmos. Chem. and Phys.

doi.org/10.5194/acp-21-3555-2021

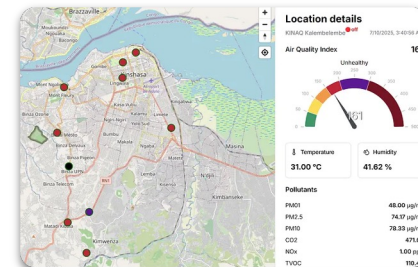


Global Burden of Disease 2021

healthdata.org/research-analysis/gbd

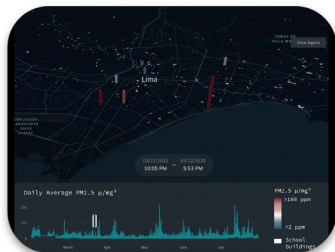
Ambient PM pollution is a leading risk factor for disease burden

Read more use-case examples:
openaq.medium.com

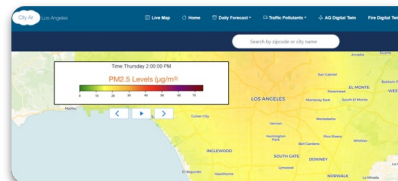


WASARU: An Air Quality Pioneer in the Democratic Republic of Congo

link.openaq.org/KINAQ

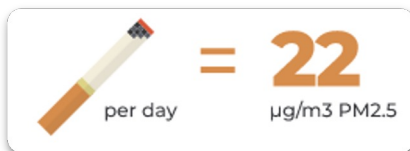


AQAI: Machine learning-powered predictive model for mapping children's exposure to air pollution
aqai.xyz



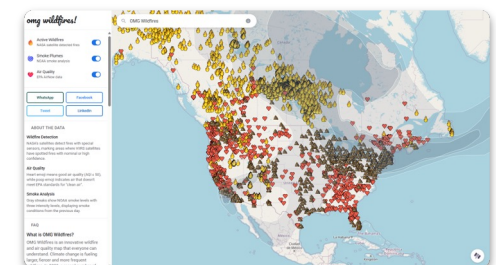
Predicting What We Breathe Los Angeles, CA

ai-aq.com/MapForecast

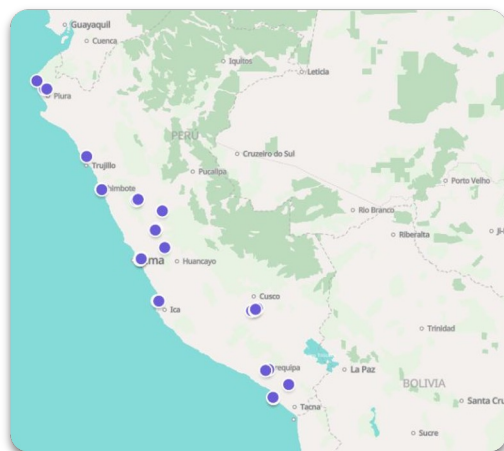


Shoot I smoke
shootismoke.app

Telegram Bot
[@pm10check](https://t.me/pm10check)



OMG Wildfires
omgwildfires.com



34 government-level reference PM_{10} and $PM_{2.5}$ monitoring stations from **Peru Organismo de Evaluación y Fiscalización Ambiental (OEFA)** are currently available on OpenAQ



To determine whether interventions in cities are making a difference, **C40** estimates annual changes in air quality using data on OpenAQ.

Clean Air Catalyst

cleanaircatalyst.org



- Global partnership: understanding of pollution sources & creating strategic coalitions to enact long-lasting change
- **Indore (India), Jakarta (Indonesia) & Nairobi (Kenya)**
- OpenAQ's role: to support data needs
- led by WRI & EDF

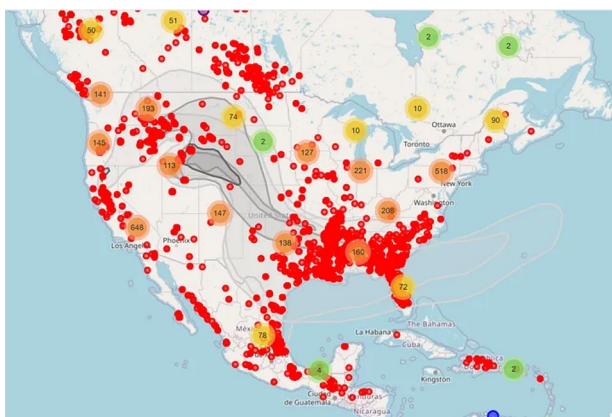


A global clean air initiative delivered by Clean Air Fund, C40 Cities and Bloomberg Philanthropies.

The programme exchanges knowledge and scales local impact.

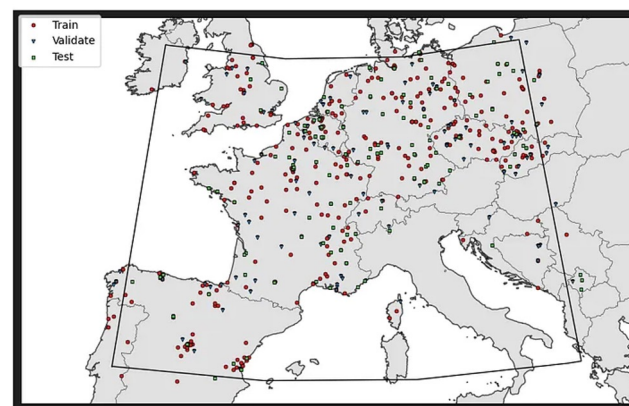
Use Cases

Using Satellites Plus Ground Sensing To Tackle Air Pollution



MELODIES MONET (NSF, NCAR and NOAA)

a toolkit that helps scientists more easily and efficiently conduct air quality research while also integrating remotely-sensed atmospheric plus ground data.



University of Eastern Finland

Researchers used OpenAQ to improve the conversion accuracy of satellite atmospheric aerosol optical depth (AOD) data

Read more:

openaq.org/about/use-cases/validating-satellite-data

Use Cases

Global validation and hybrid calibration of CAMS and MERRA-2 PM_{2.5} reanalysis products based on OpenAQ platform

C Jin, Y Wang, T Li, Q Yuan. Atmos Environ, 2022. 118972. doi.org/10.1016/j.atmosenv.2022.118972

Highlights:

CAMS and MERRA-2 PM_{2.5} reanalysis products were validated on both the regional and global scale using global in-situ PM_{2.5} observations from 2017-2019 obtained from OpenAQ.

- These were used to validate CAMS and MERRA-2 reanalysis products
- Researchers applied machine learning models (specifically, Extremely Randomized Trees or ERT) to correct biases in CAMS and MERRA-2 using data in OpenAQ as the reference.
- Gap-free global daily PM_{2.5} concentration maps were created for spatiotemporal analysis.

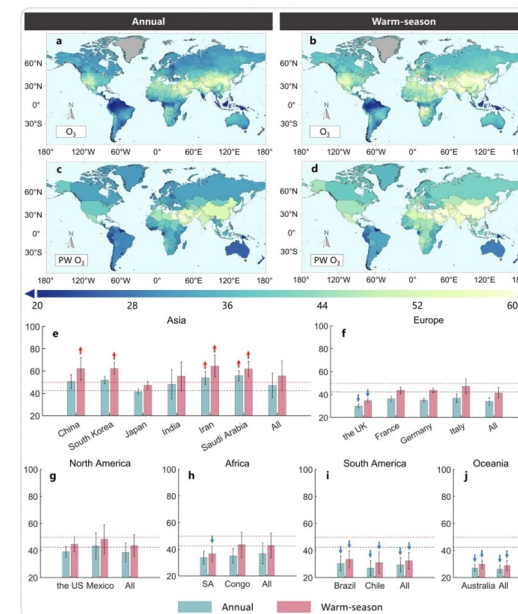
Use Cases

Substantially underestimated global health risks of current ozone pollution

Y Wang, et al. *Nature Communications*, 2025. 16, Article number: 102.
doi.org/10.1038/s41467-024-55450-0

Highlights:

- This study used OpenAQ as the primary source of in-situ ozone measurements to train and validate its global modelling framework.
- Measurements during 2019–2021 are collected and calculated to MDA8 ambient O₃ concentrations (regarded as the ground truths).
- Estimated that 66.2% of the global population is exposed to excess ozone for short term (> 30 days per year), and 94.2% suffers from long-term exposure.





explore.openaq.org

aqihub.info

info@openaq.org

Have feedback on the platform?
link.openaq.org/2025communitysurvey

Get to know our partners and users
openaq.medium.com

Applications for 2026 Cohort of the
OpenAQ Ambassador program is now open!
ambassadors.openaq.org