



Air Quality Sensor Bootcamp

Use Cases

Lessons Learned from
Air Monitoring Projects
in 70+ Countries



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Lessons Learned from Air Monitoring Projects in 70+ Countries



Sean Wihera

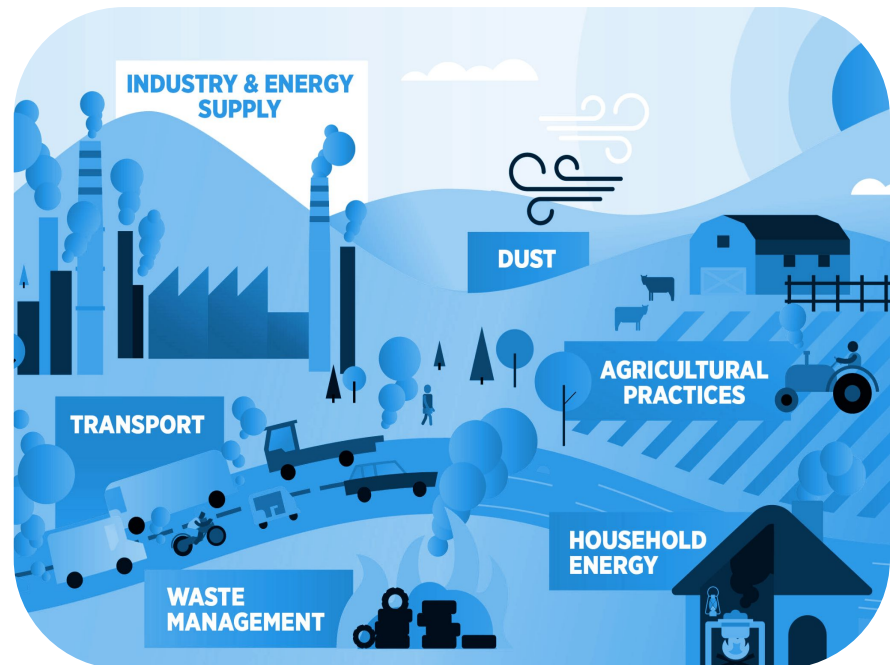
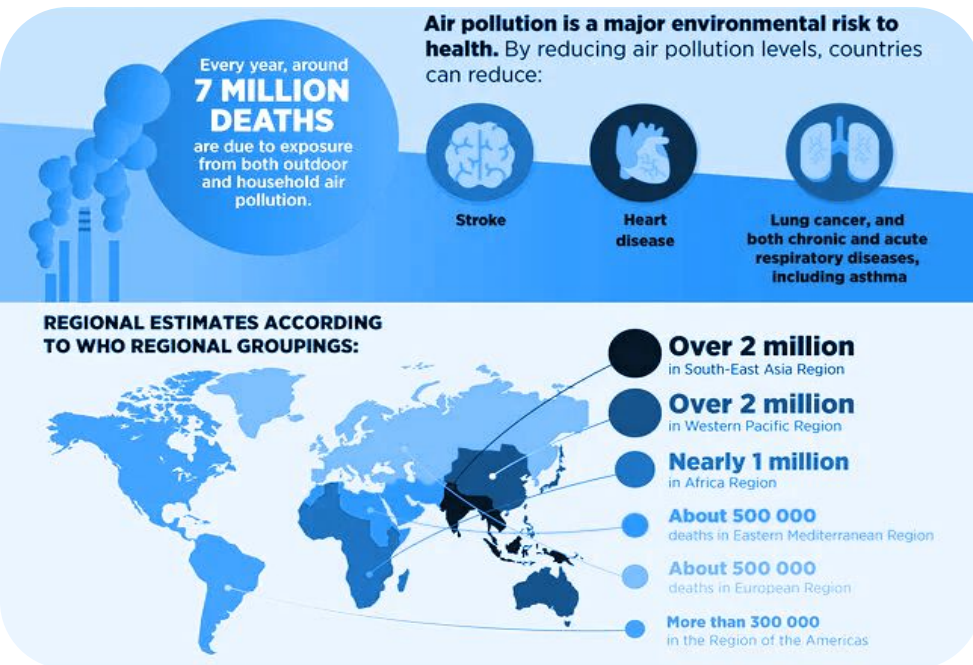
VP of Business
Development at Clarity

Agenda

- 01** Introduction and Recap
- 02** The “Clarity Model”
- 03** Case Studies - Global Air Sensor Projects
- 04** Q&A



Recap: Air Pollutants & Air Sensors 101



Global air pollution crisis

Air pollution is the most pressing environmental health issue today.

7 million premature deaths are linked to air pollution annually as the **#1** environmental cause. (WHO)



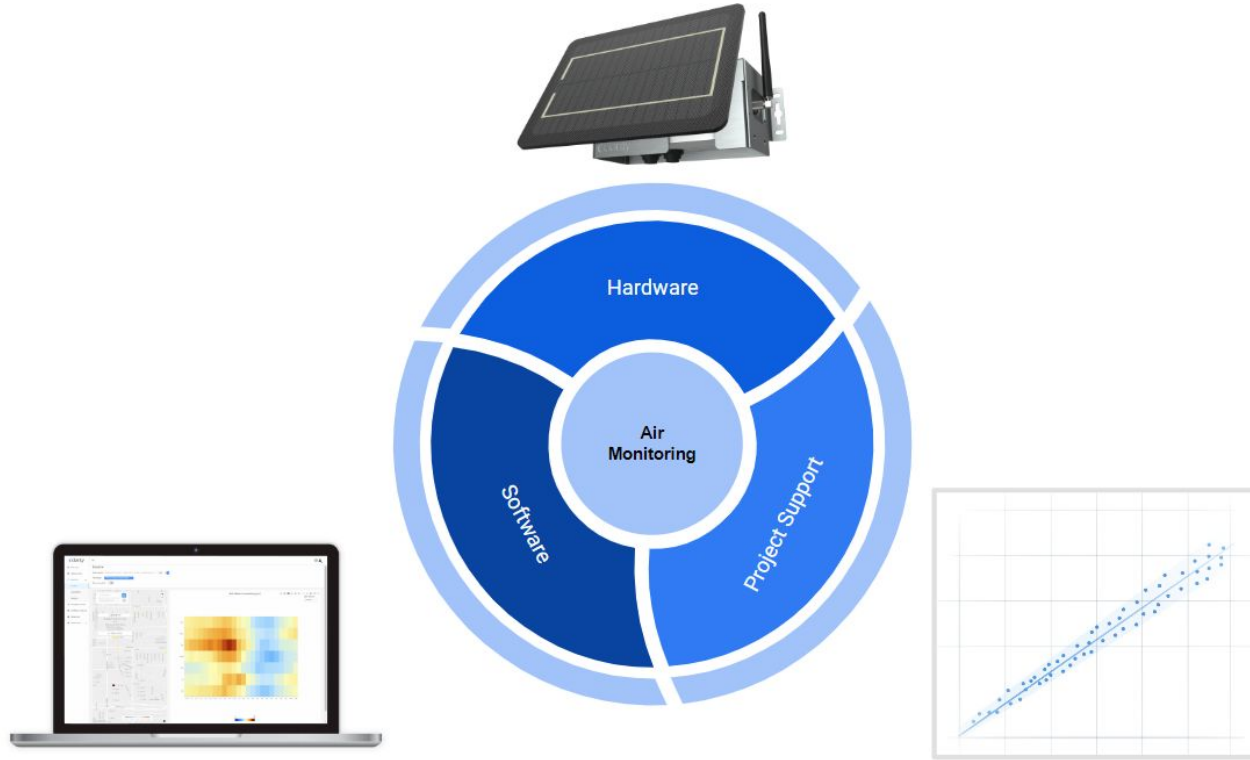
Failure to manage air pollution costs governments and industries **\$8.1 Trillion USD annually**. (World Bank/IHME)

The opportunity

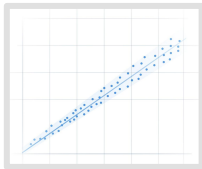
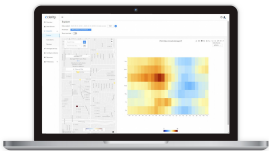
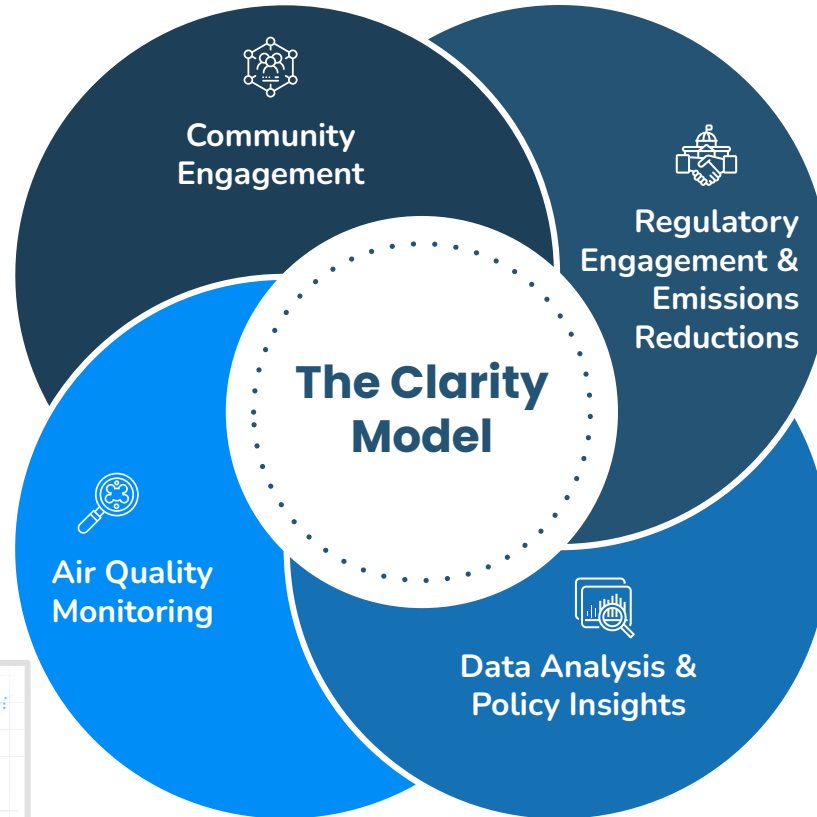
We can cost-effectively **measure health cost savings and reduced burden of disease** at the actual scale of procurements and policies.

This can greatly **improve the recognized value proposition of decarbonization activities** or de-risk future clean air investments.

From innovative technology “Projects”...



...to regional “Programs”: Air Quality Management 2.0



Air Quality Management 2.0: Why Regional Programs?



Scalability and Efficiency

- Avoid duplicative costs of separate projects and additional costs of integration.
- Establishing data QA/QC is challenging and expensive!
- Create consistent data sets useful for policy and analysis.



Inclusivity

- Air quality is a “horizontal” challenge - enable the critical collaboration across sectors (e.g. health, energy, transport, environment, etc.)
- Build trust and transparency by engaging the public - manage the narrative.



Funding

- Builds a single “brand” for regional air management.
- Facilitates Public Private Partnerships and enables non-traditional finance.
- Generates political capital

Breathe London

London, United Kingdom

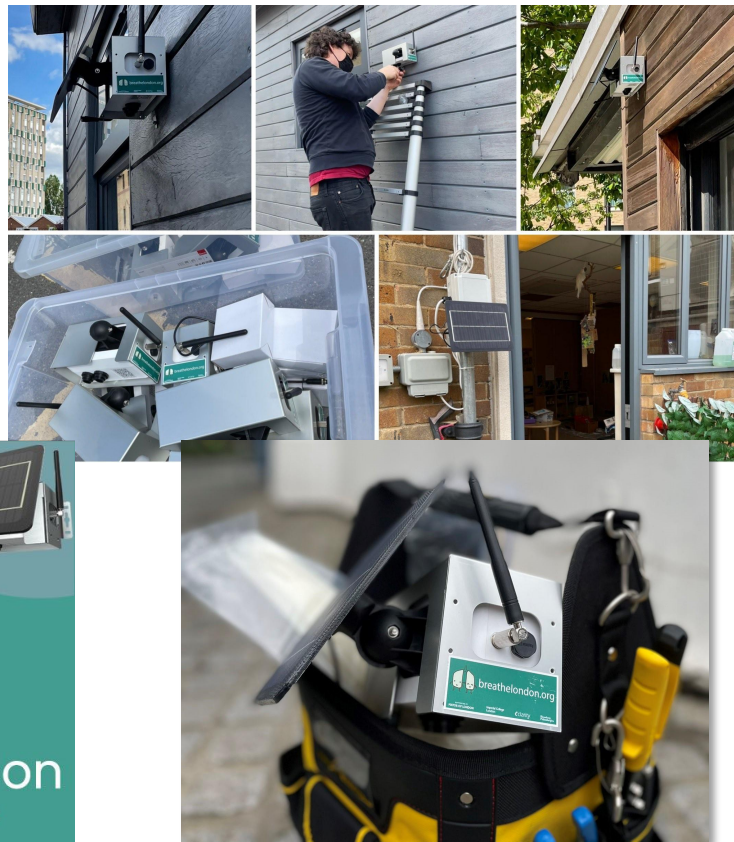
Number of
Clarity Nodes: **450+**

"I am delighted that Londoners will now have access to real-time, accurate air quality data for their area from more than 400 monitoring sites. This will improve awareness and help people reduce their exposure to polluted air, and better target efforts on improving air quality at a local level."



Sadiq Khan
Mayor of London

Action Enabled:
**Improve air quality with
targeted policies**



Breathe London

London, United Kingdom

Number of
Clarity Nodes: **400+**

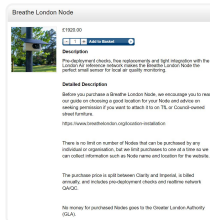
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**Bloomberg
Philanthropies**

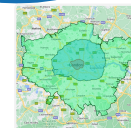
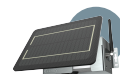


Community Engagement
(GLA, Boroughs, Hospitals,
Schools)

**Regulatory
Engagement &
Emissions
Reductions**
(Defra, GLA,
LAQN)

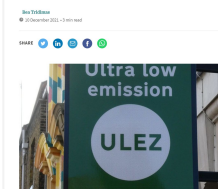
Air Monitoring
(Clarity + LAQN)

Data Analysis & Policy Insights
(Imperial College London)



**GREATER
LONDON
AUTHORITY**

**London ULEZ expansion
achieved 92 per cent
compliance rate in first
month**



**Imperial College
London**

Breathe London

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Prioritized measure 1

Expansion of the Ultra Low Emission Zone (ULEZ)

Components:

Increase ULEZ area coverage; Implement stricter emission standards; Enhance vehicle compliance checks; Raise public awareness on ULEZ

Prioritized measure 2

Promotion & enforcement of anti-idling campaigns at schools

Components:

Develop anti-idling policy; Conduct awareness campaign; Install signage near schools; Regular enforcement and fines

Prioritized measure 3

Establishing wood burning guidelines

Components:

Develop guidelines for wood use; Promote smoke control options; Educate on proper wood burning; Encourage alternative heat sources

Prioritized measure 4

Creation of low emission bus zones

Components:

Identify high pollution areas; introduce low emission buses; Optimize bus routes & schedules; Monitor air quality improvement

40.3

%

Of domestic energy production is coal- fuelled nationally and 57% of the population of Bishkek heat their homes with coal.



ABEC – Bishkek

Bishkek, Kyrgyzstan

Number of
Clarity Nodes: **50**

“Bishkek needs system-wide action with innovative energy solutions to tackle the pollution challenge and make the switch to clean and affordable heating and transport technologies. The most vulnerable and marginalised people play an important role in changing consumption patterns.”



Louise Chamberlain
UNDP Resident Representative

Action Enabled:
**Improve air quality with
targeted policies**

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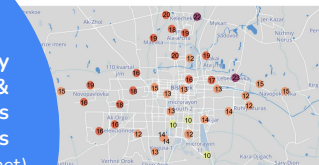
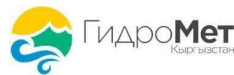
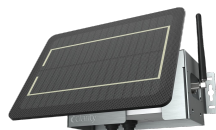


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UNDP Resident Representative

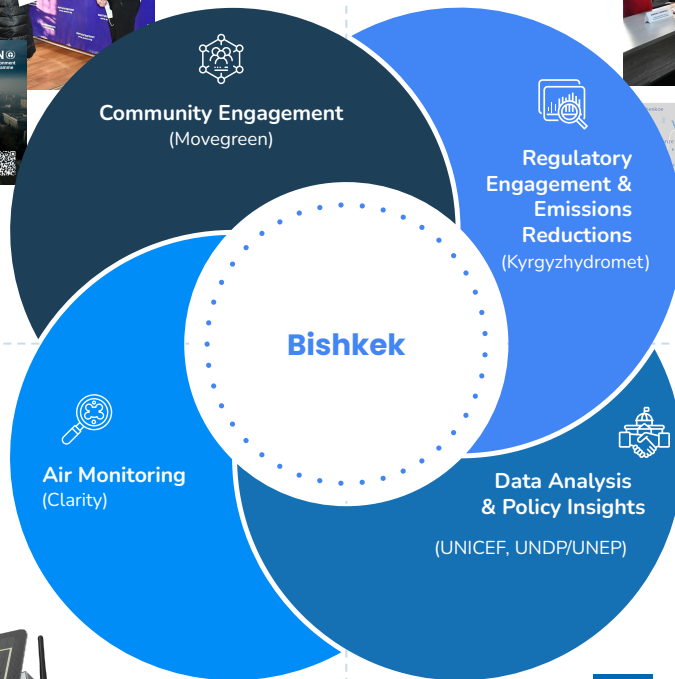
Action Enabled:
**Improve air quality with
targeted policies**



**MOVE
GREEN**



spatial distribution of PM_{2.5} concentration in Bishkek based on data from Clarity sensors
seven-month period (06.2-10.9.2021).



unicef



Prioritized measure 1

Measurement and enforcement of transport emissions

Components:

Remote sensing study; Inspection program; Public outreach campaign; Enforcement program.

Prioritized measure 2

Baseline including monitoring and evaluation of impact

Components:

Quality Management Group; 3-D air pollution map; Emission reduction monitoring and evaluation database/software/program.

Prioritized measure 3

Conversion of household heating systems from coal to cleaner fuels

Components:

Capital expenditure and technical assistance for the Energy Efficiency within the Housing and Public Utilities sector; Graduated subsidies by household income.

Prioritized measure 4

Update the construction rules for Bishkek urban planning and development

Components:

Protocol for construction times, dates and locations; Air filtration systems or mechanical ventilation systems where applicable at work sites.

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Action Enabled:
Improve air quality with targeted policies

Royal Automobile Club of Western Australia

Perth, Australia

Number of
Clarity Nodes: **200+**

"Through the RAC Air Health Monitor, we want to accelerate action to reduce vehicle emissions in Western Australia. This requires government and individual behavioural change, investment and education to support electric vehicle uptake and tackle congestion."



Patrick Walker
RAC WA

Action Enabled:
**Improve air quality with
targeted policies**



For the better



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targeted policies**



**Biggest network in
Australia**
200 sensors to be deployed



Pollutants measured
PM_{2.5}, PM₁₀ and NO₂

**The West
Australian**



Community Engagement
(RAC, Schools, Media Coverage)



Air Monitoring
(Clarity + Ramboll)



Data Analysis & Policy Insights
(RAC Air Health Monitor)



**Regulatory
Engagement &
Emissions
Reductions**
(DWER, Western
Australia
Department of
Health, Main
Roads WA)



Department of
Water and Environmental
Regulation

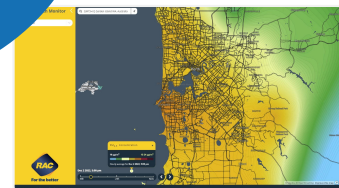


Government of
Western Australia
Department of Health



**RAC Air Health Monitor
coverage**

Over 9,730km² covered



RAMBOLL

Royal Automobile Club of Western Australia

Perth, Australia

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Clarity Nodes: **200+**

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RAC WA

Action Enabled:
**Improve air quality with
targeted policies**

Prioritized measure 1

Online public health monitor tool and campaign

Components:

Live air quality monitoring map; education campaign on actions citizens can take; emission reduction checklist; community case studies

Prioritized measure 2

Encouraging reduction in vehicle emissions

Components:

Investment in alternative transport options; Promotion of electric vehicle uptake; Incentivizing walking, cycling, and public transport use; Congestion management strategies.



Quezon City

Quezon City, Philippines

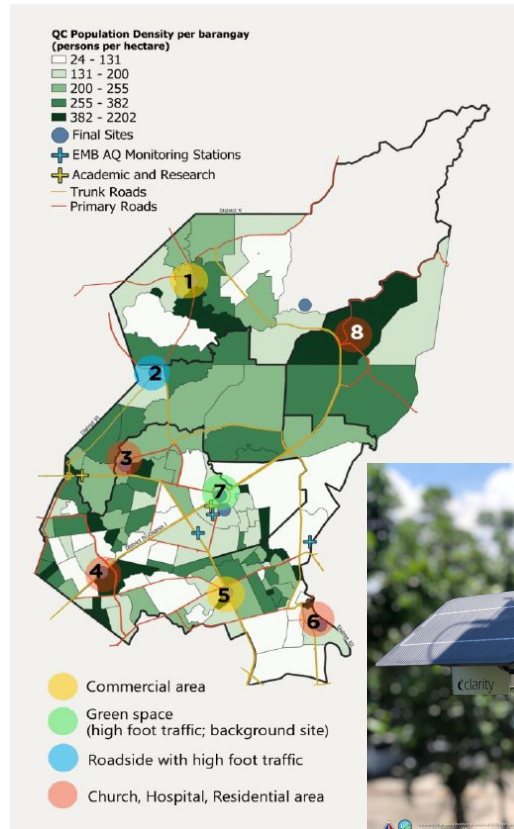
Number of
Clarity Nodes: **20**

“We are advancing steadily to the attainment of cleaner air for our citizens. Real-time air quality data can lead to more specific air quality management actions and decisions – identifying sources and locations we need to focus on while providing guidance on health exposure of our citizens.”



Josefina Belmonte
Mayor, Quezon City

Action Enabled:
**Improve air quality with
targeted policies**



Quezon City, Philippines

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EMB



**C40
CITIES**



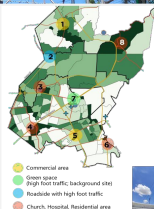
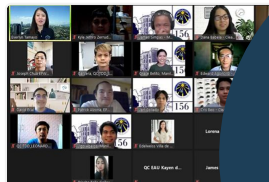
Quezon City

Community Engagement
(Barangays, Schools, Hospitals)

**Regulatory
Engagement &
Emissions
Reductions**
(EMB-NCR,
QC-CCESD)

Air Monitoring
(Clarity)

Data Analysis & Policy Insights
(Clean Air Asia, C40)



Prioritized measure 1

Eco-friendly transportation policy

Components:

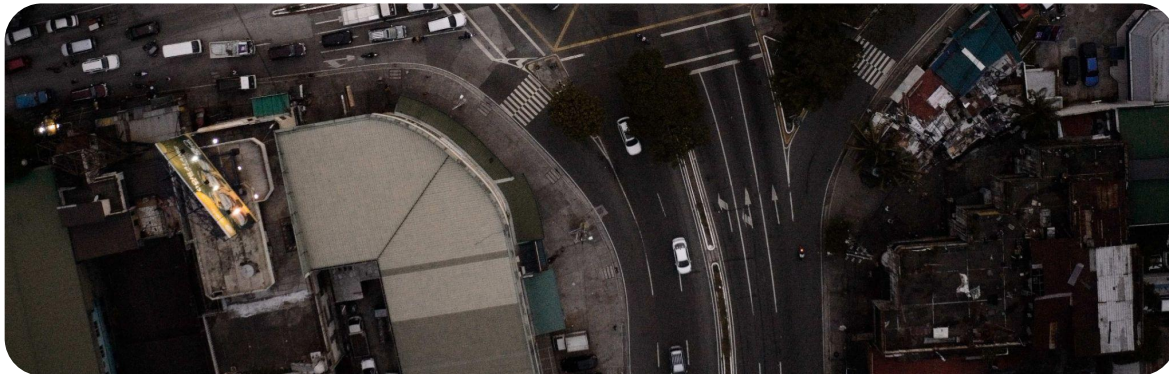
Creation of bike lane network, installation of bike ramps, creation of grade-separated bike crossings

Prioritized measure 2

Improve industrial emission control standards

Components:

Regular inspections; Implement updated standards for emissions; Incentives for pollution reduction efforts; Enforce stricter penalties for violators.



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Quezon City, Philippines

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Los Angeles Unified School District

Los Angeles, California

Number of
Clarity Nodes: **200+**

"The Know Your Air Network will provide us with vital air quality information that can be used to inform real-time decisions to protect the health and well-being of our school communities. This air quality sensor network demonstrates LAUSD's commitment to providing the safest learning environment for our students."



Carlos Torres
LAUSD

Action Enabled:

**Protect student + employee
health with real-time AQ data**

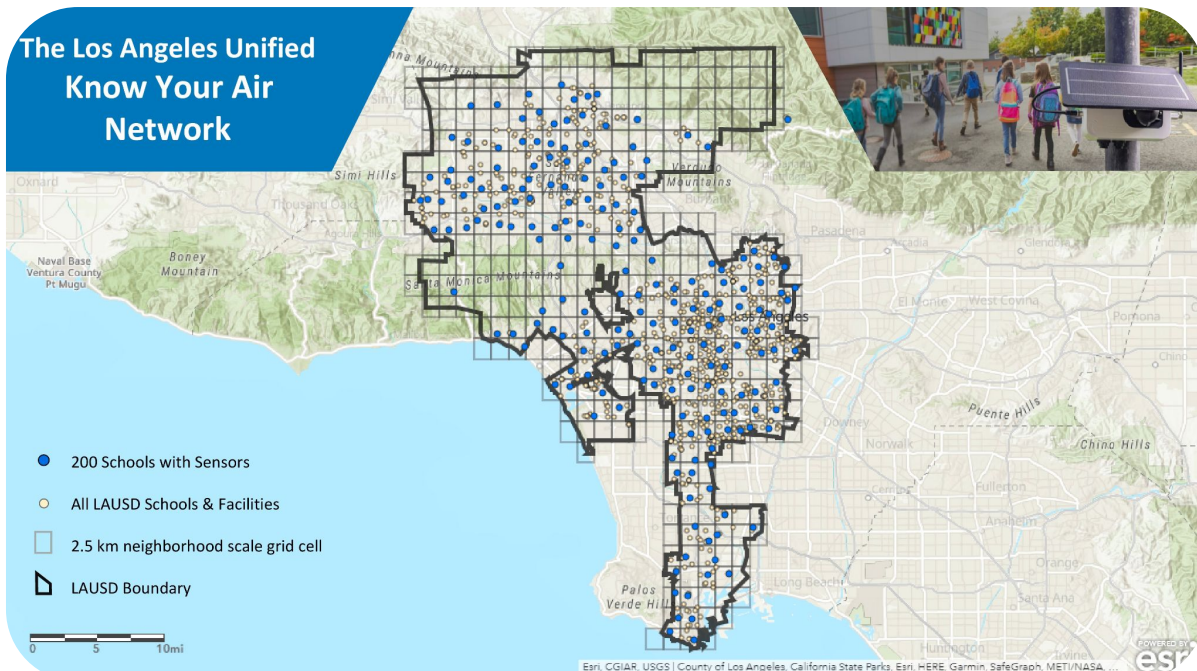


LAUSD

UNIFIED



The Los Angeles Unified Know Your Air Network



Los Angeles Unified School District

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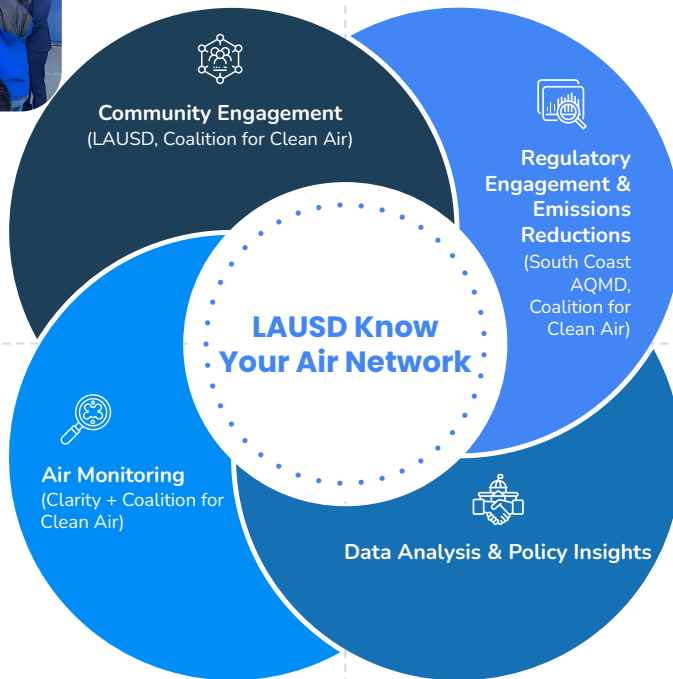


Carlos Torres
LAUSD OEHS

Action Enabled:
**Protect student + employee
health with real-time AQ data**



COALITION FOR CLEAN AIR



200+ 710 700k

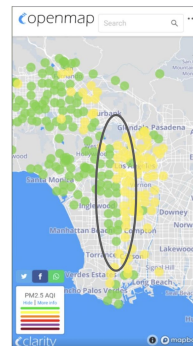
Node-S devices

Miles² covered

Students served



**South Coast
AQMD**



**Visible air quality
gradient along highway**

Los Angeles Unified School District

Los Angeles, California

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Clarity Nodes: **200+**

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LAUSD OEHS

Action Enabled:
Protect student + employee health with real-time AQ data

Prioritized measure 1

Protect student health during air pollution events

Components:

The LAUSD Office of Environmental Health and Safety uses the KYAN to monitor air pollution and send out operational alerts (example below) in real time to protect stakeholders during wildfires and other extreme AQ events.

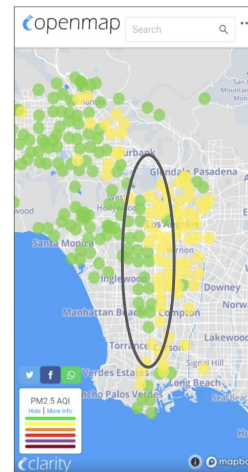
Activity	0 to 50 GOOD	51 to 100 MODERATE	101 to 150 UNHEALTHY FOR SENSITIVE GROUPS	151 to 200 UNHEALTHY	201 to 300 VERY UNHEALTHY
Recess (15 min)	No Restrictions	No Restrictions	Make indoor space available for children with asthma or other respiratory problems	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.	Restrict outdoor activities to light to moderate exercise.
P.E. (1 hr)	No Restrictions	No Restrictions	Make indoor space available for children with asthma or other respiratory problems	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.	Restrict outdoor activities to light to moderate exercise not to exceed one hour.

Prioritized measure 2

Educate students and local community about air quality issues

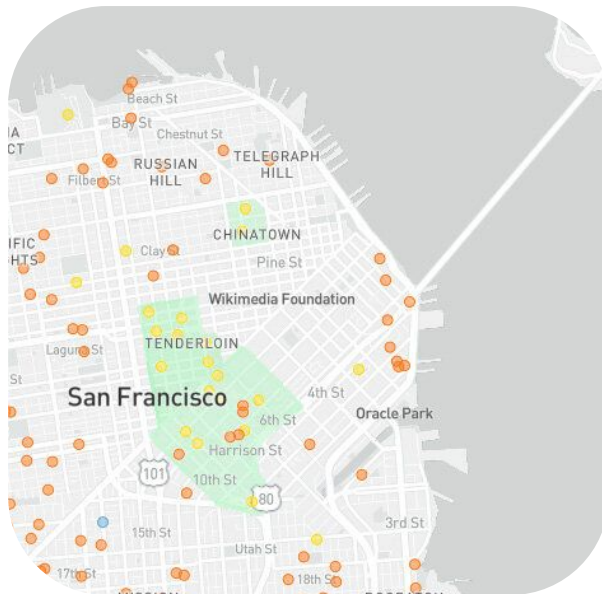
Components:

The KYAN provides localized AQ data at a scale not seen before in Los Angeles. LAUSD is using data to educate students, parents and more.



Visible air quality gradient along highway

brightline DEFENSE



**Brightline
Defense**

San Francisco, California

Number of
Clarity Nodes: **20+**

“Air quality is a hidden issue in the sense that it’s become so embedded in aspects of urban life in San Francisco. It can be a challenge for residents who have been living in the neighborhood for a long time to articulate what their air quality issues are. Some have just accepted it as a way of life.”



Eddie Ahn
Executive Director

Action Enabled:

**Air quality awareness,
education, and outreach**



Brightline Defense

San Francisco, California

Number of Clarity Nodes: **20+**

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Executive Director

Action Enabled:

Air quality awareness, education, and outreach

Prioritized measure 1

Air quality monitoring & data analysis in underrepresented zones

Components:

Published report “Little Room to Breathe”

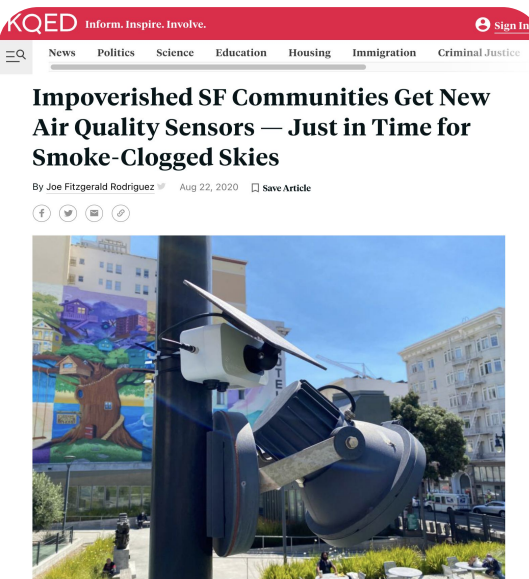


Prioritized measure 2

Raise awareness of air quality issues

Components:

Community workshops, poster campaigns, and media coverage.



Brightline Defense

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Eddie Ahn
Executive Director

Action Enabled:

Air quality awareness, education, and outreach

Challenges and Gaps:



Technology Limitations



Need for Analysis & Local Capacity



Interagency Alignment & Regional Collaboration

Conclusions & Key Points

- The integration of new measurement technologies and multi-stakeholder partnerships have greatly improved our ability to quantify and manage regional air pollution.
- Air Quality Management 2.0 represents an opportunity to better quantify the complex costs of air pollution and benefits of many potential “climate” investments.
- Air quality management is inherently a regional, multisectoral challenge requiring significant coordination and alignment. Establishing scalable, inclusive partnerships (or “Programs”) is critical for efficiency and success.



Register for the next webinar on June 21st!

**Implementation — Best Practices for Air
Sensor Network Design**

June 21, 9am PT/6pm CEST



Dr. Maggie Isied

Business
Development
Manager





Thank you!

Questions?

