



LEADING THE CLEAN AIR MOVEMENT

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# 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](#))



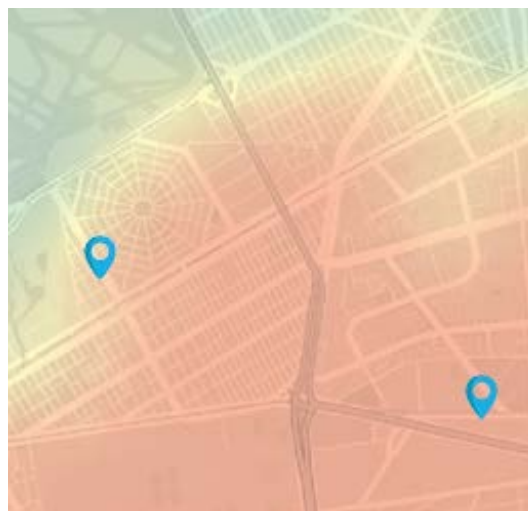
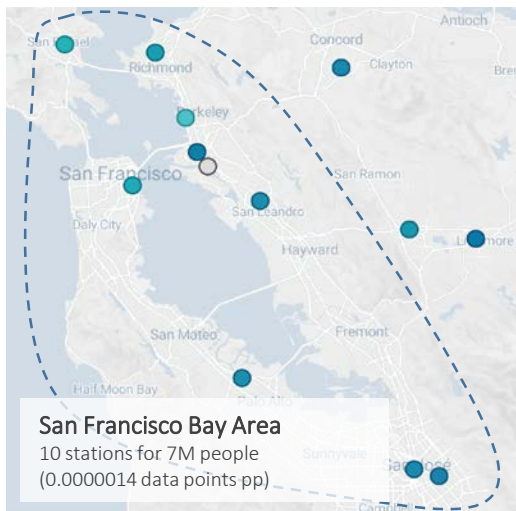
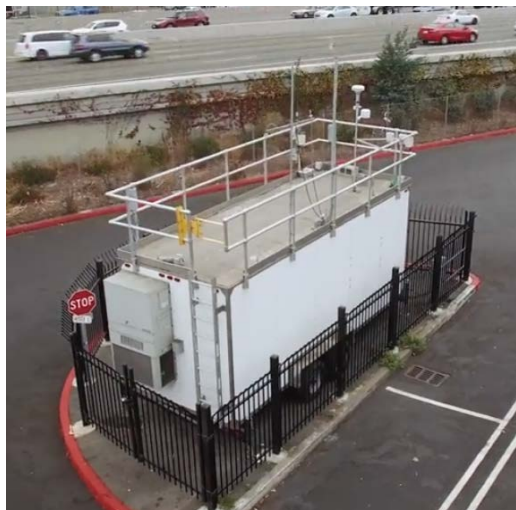
Air pollution is a **trillion dollar** problem

Failure to manage air pollution costs governments and industries **\$5 Trillion USD** annually. ([World Bank/IHME](#))

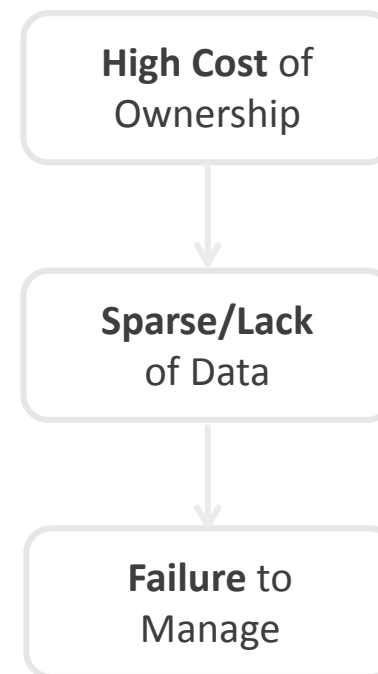


# WHAT'S THE PROBLEM?

Lack of data results in air pollution management failures and an unclear ROI on related interventions.



## Traditional Monitoring Technology



*"If you can't measure it, you can't manage it, and you can't fix it."*

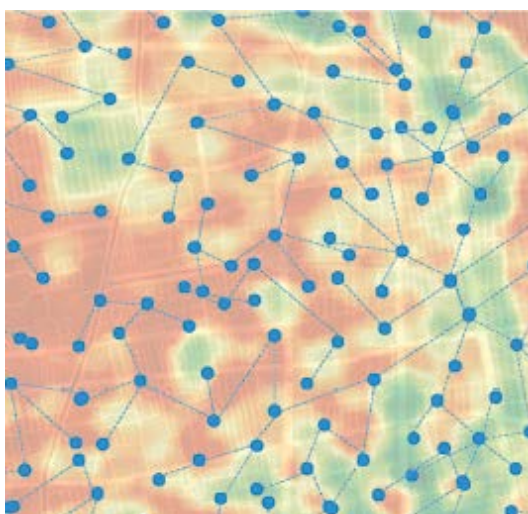
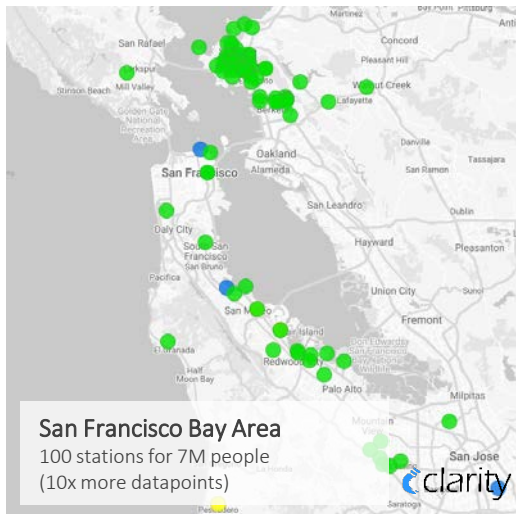
*-Michael Bloomberg*



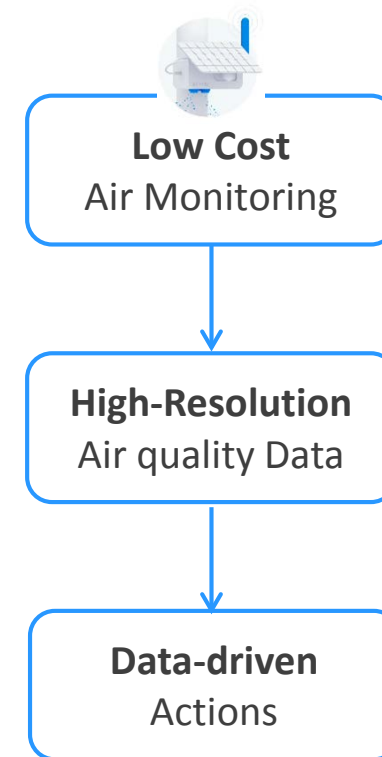


# WHAT'S THE SOLUTION?

Clarity enables data-driven air quality management.



## Clarity Air Monitoring

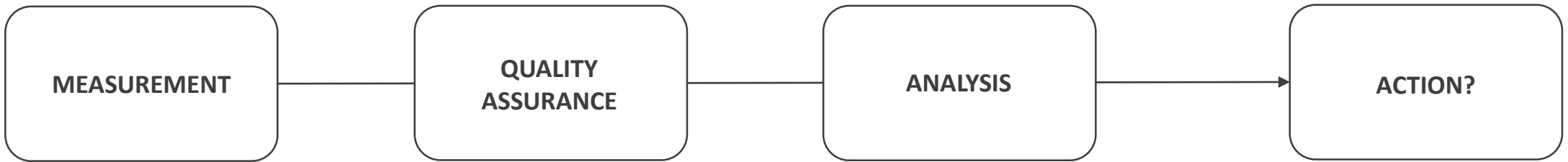


*"If you CAN measure it, you CAN manage it, and you CAN fix it."*

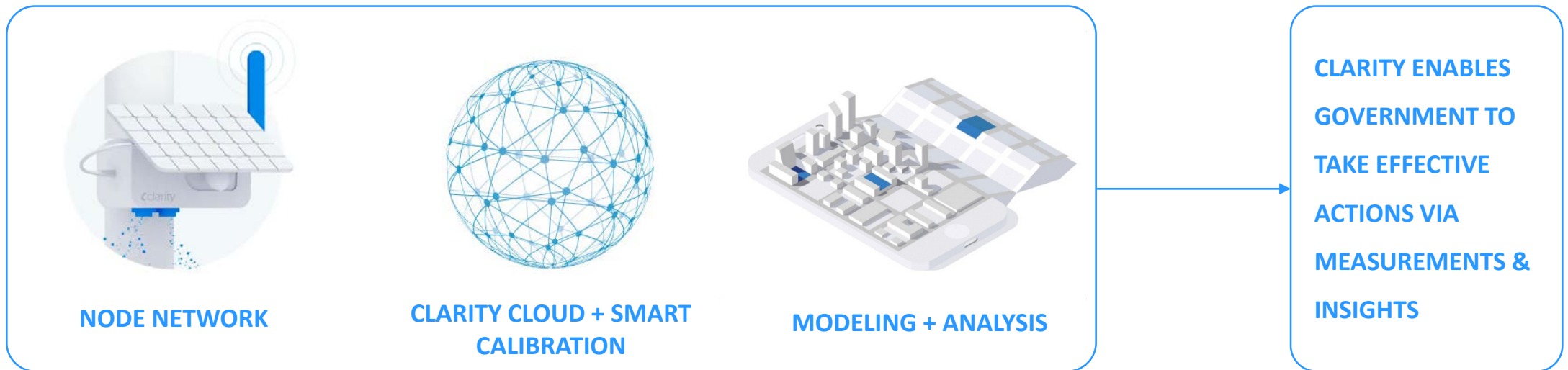
-Clarity Movement

# WHAT'S THE SOLUTION?

## AIR QUALITY MANAGEMENT



## CLARITY



# CLARITY AIR QUALITY MONITORING

## 01 CLARITY NODE NETWORK

- $PM_{2.5}$ ,  $PM_{10}$ ,  $NO_2$ , temperature, humidity
- Easy self-guided deployment



## 02 CLARITY CLOUD + SMART CALIBRATION

- Modular communication
- Secure Cloud storage & access
- Intelligent data accuracy correction

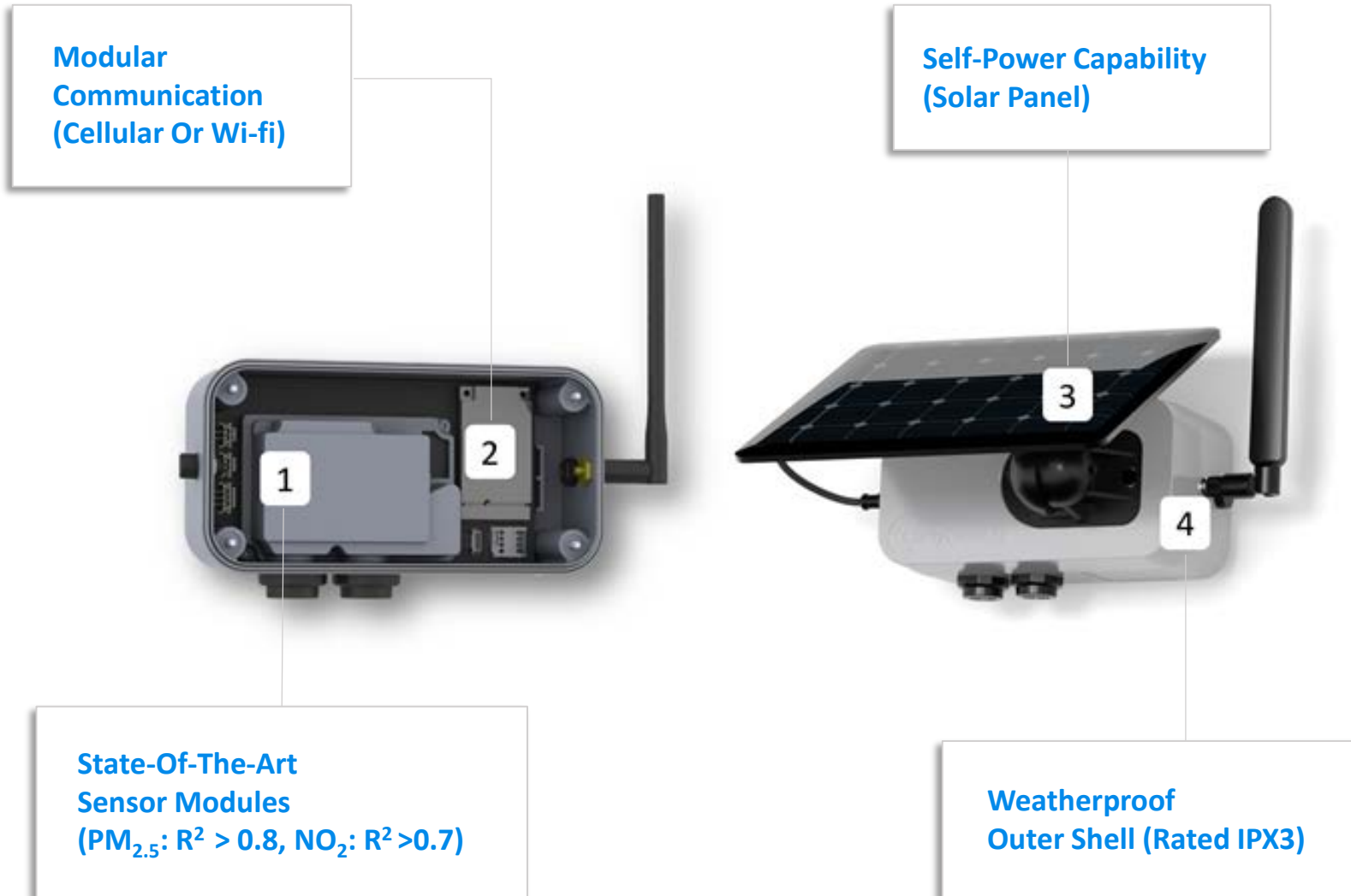


## 03 MODELING + ANALYSIS

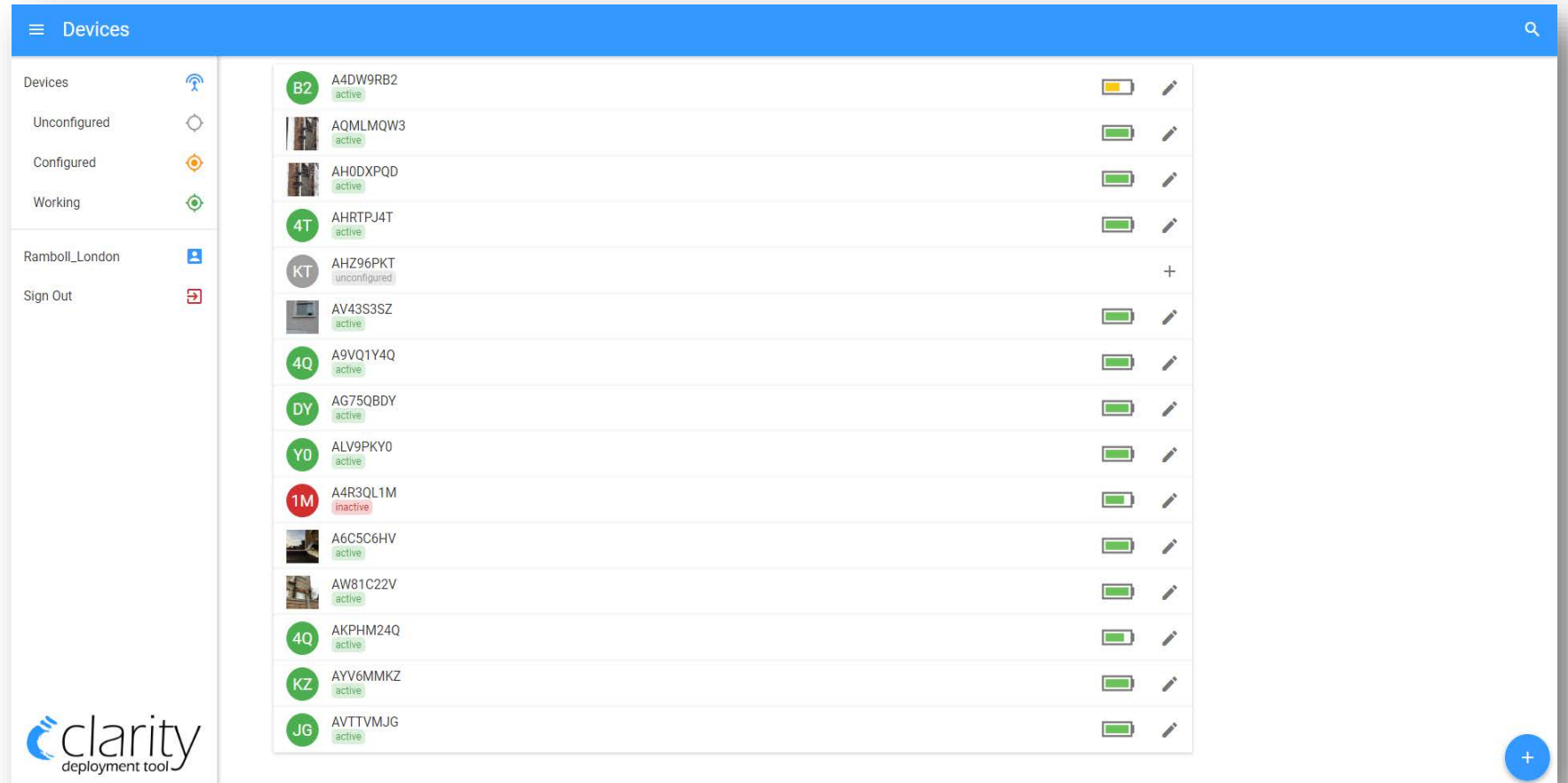
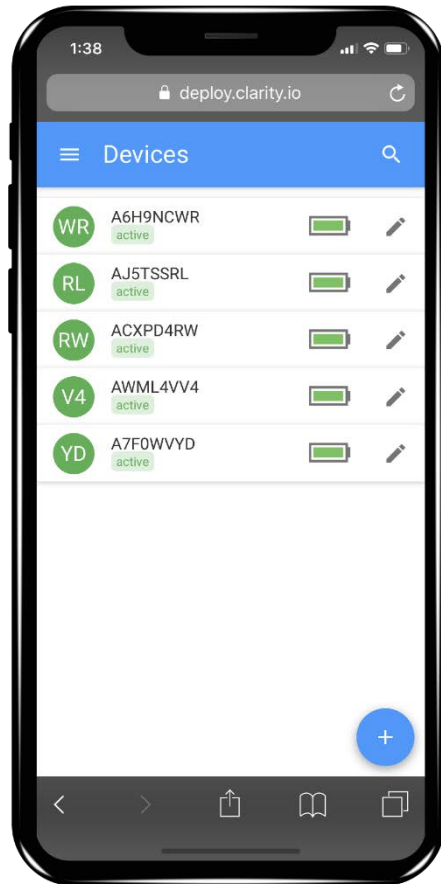
- Pollution hotspot analysis
- Policy evaluation & planning
- Better prediction models



# CLARITY AIR QUALITY MONITORING



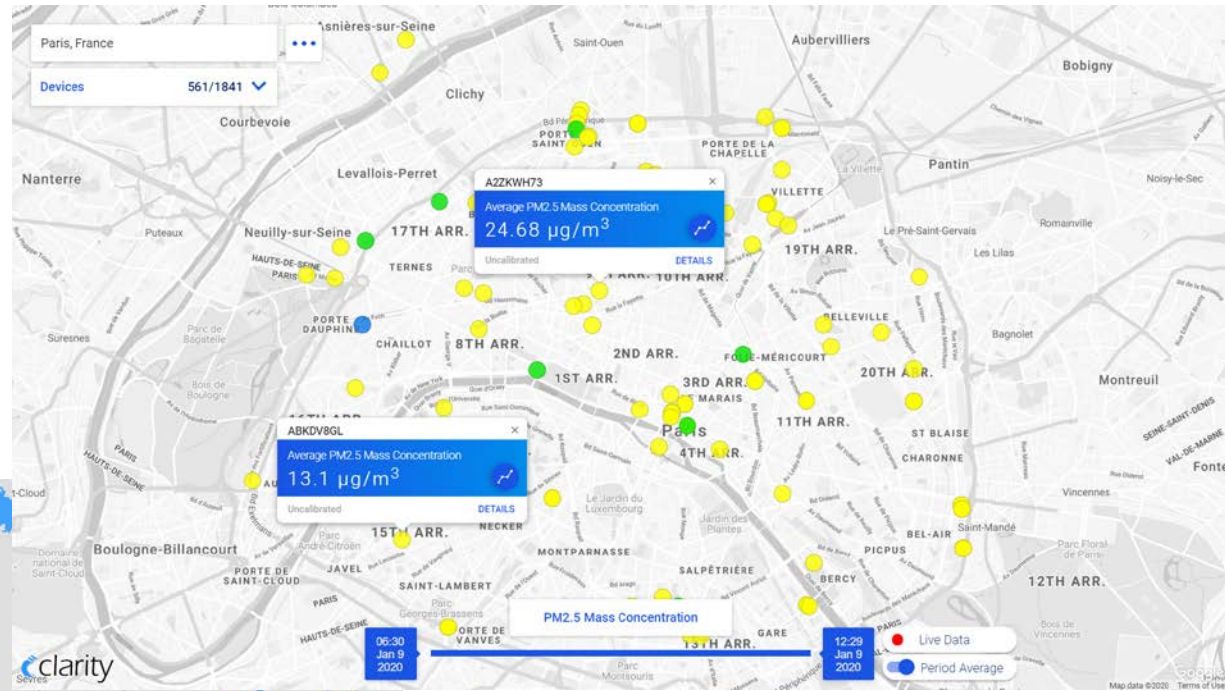
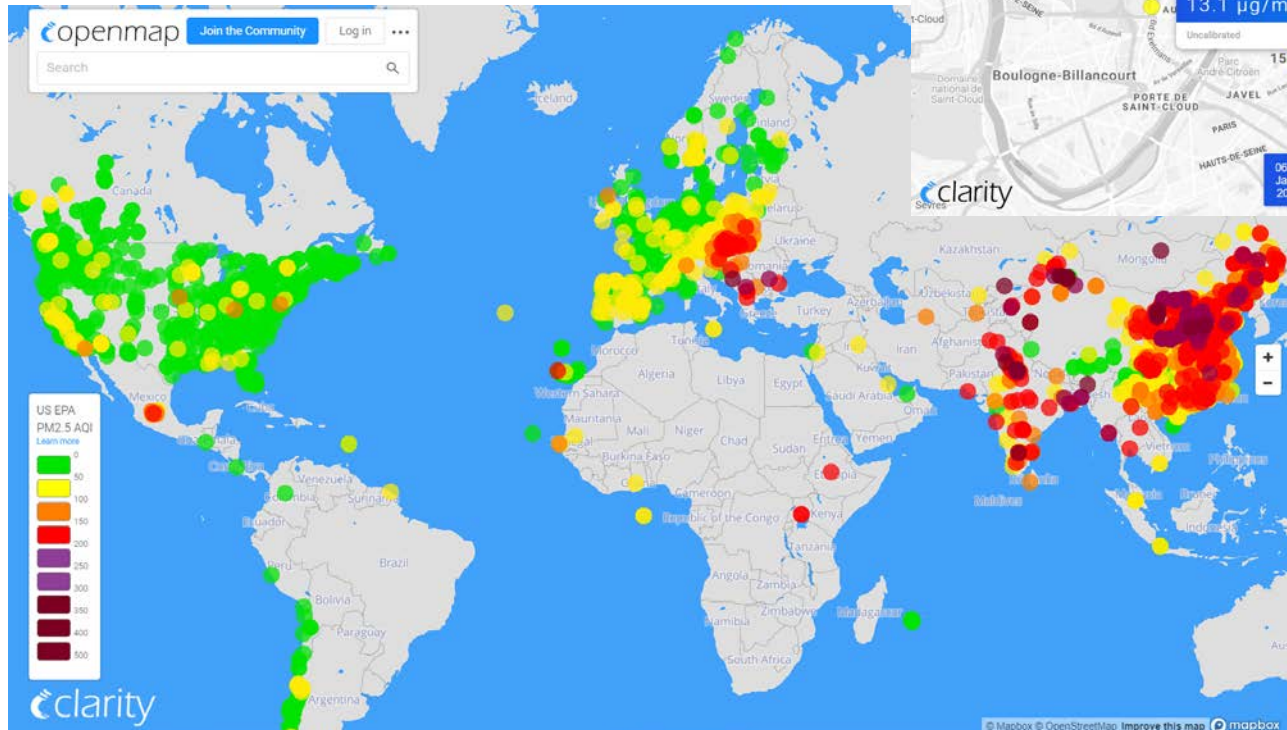
# CLARITY DEPLOYMENT TOOL





# CLARITY DATA VISUALIZATION

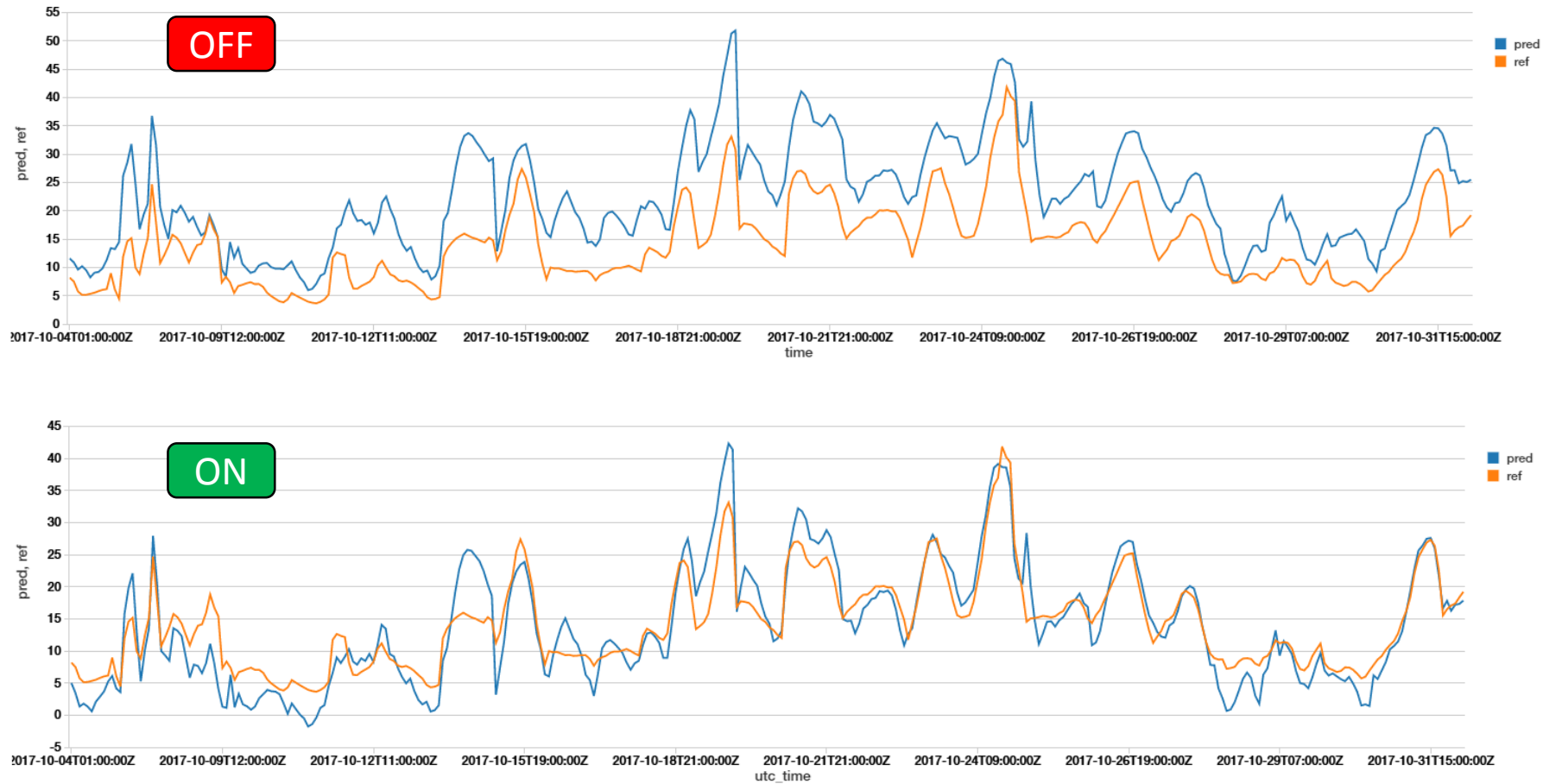
## SMARTCITY DASHBOARD FOR HISTORICAL DATA VISUALIZATION, COMPARISON AND DOWNLOAD



OPENMAP, FOR DATA SHARING WITH PUBLIC

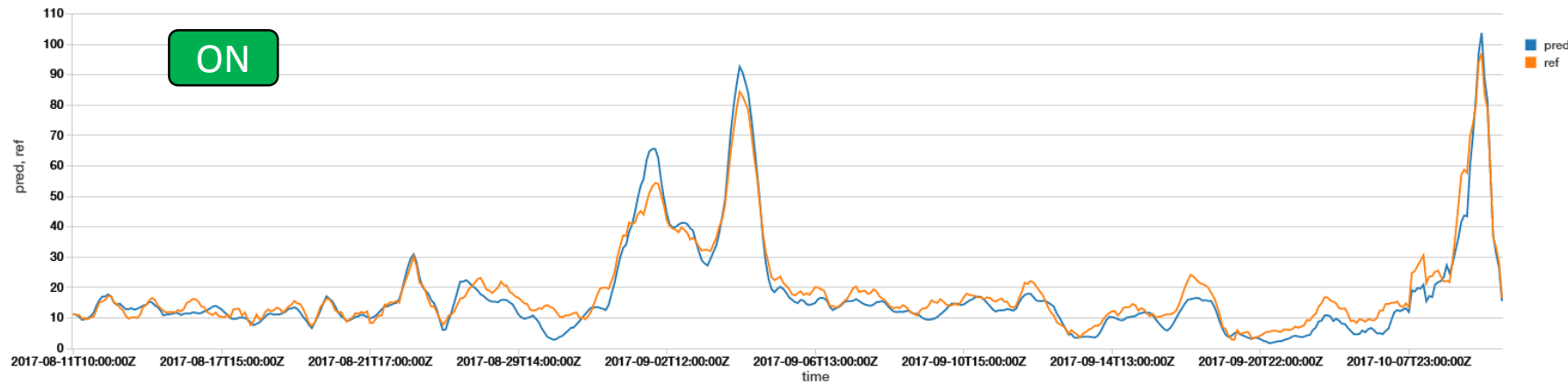
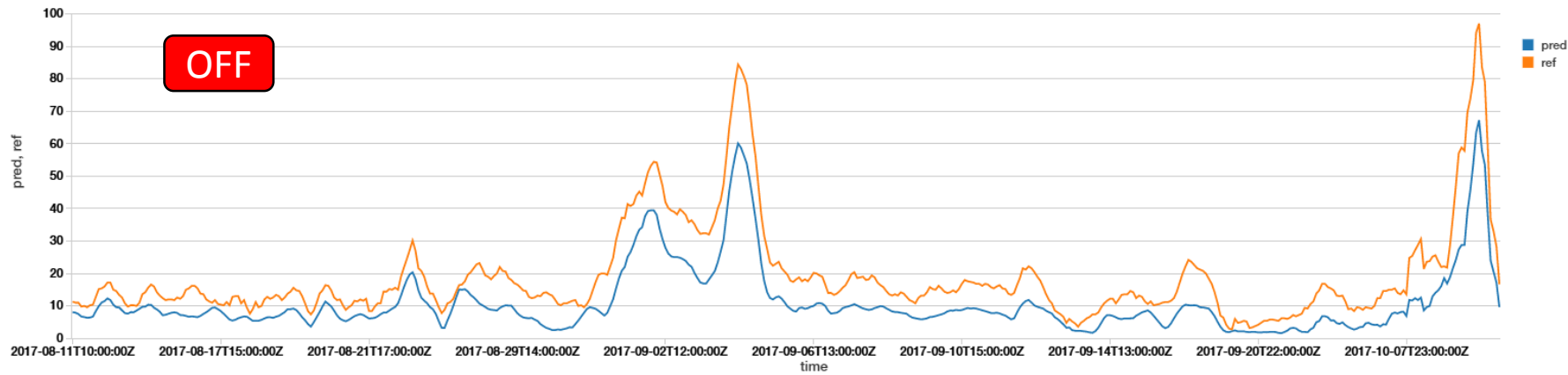
# SMART CALIBRATION & REGULATORY COMPARISONS

## Example 1: SE Asia (Confidential)



# SMART CALIBRATION & REGULATORY COMPARISONS

## Example 2: Bay Area, California





\$1,000 USD / Measurement Point / Year

CLARITY NODE NETWORK

CLARITY CLOUD + SMART CALIBRATION

MODELING + ANALYSIS



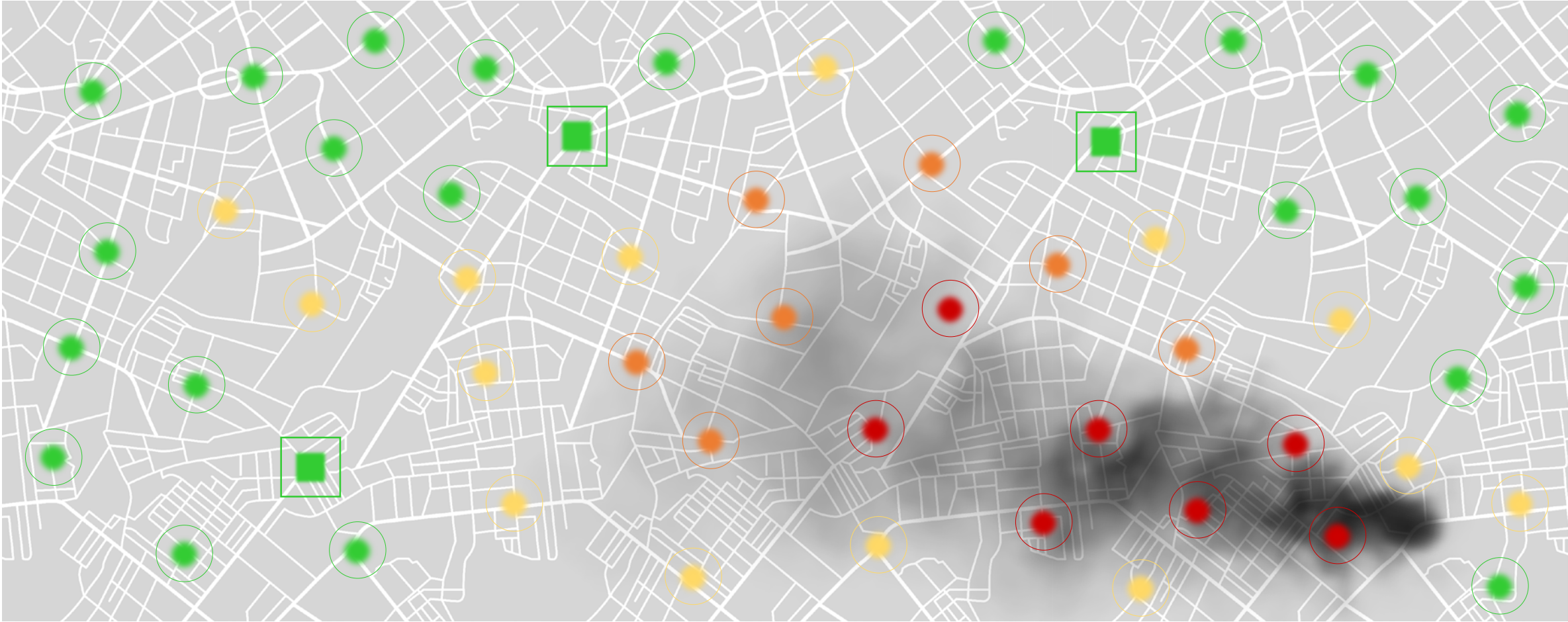




## ..... EXAMPLE HOTSPOT DETECTION .....



## EXAMPLE HOTSPOT DETECTION

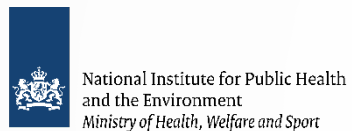


## EXAMPLE 50 NODE NETWORK

# EXAMPLES PARTNERS & CUSTOMERS

## Network Management

### VALIDATED BY

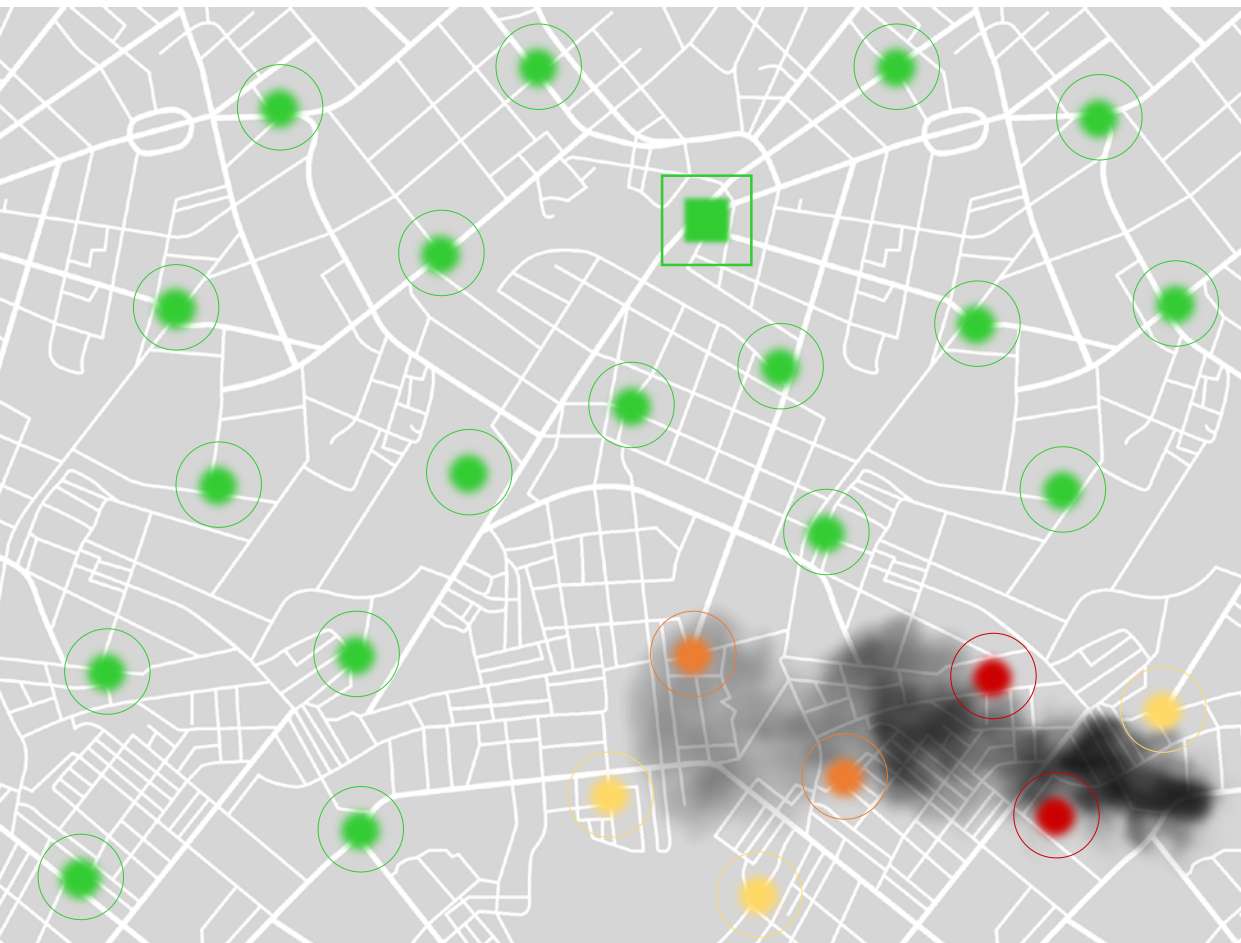


### TRUSTED BY

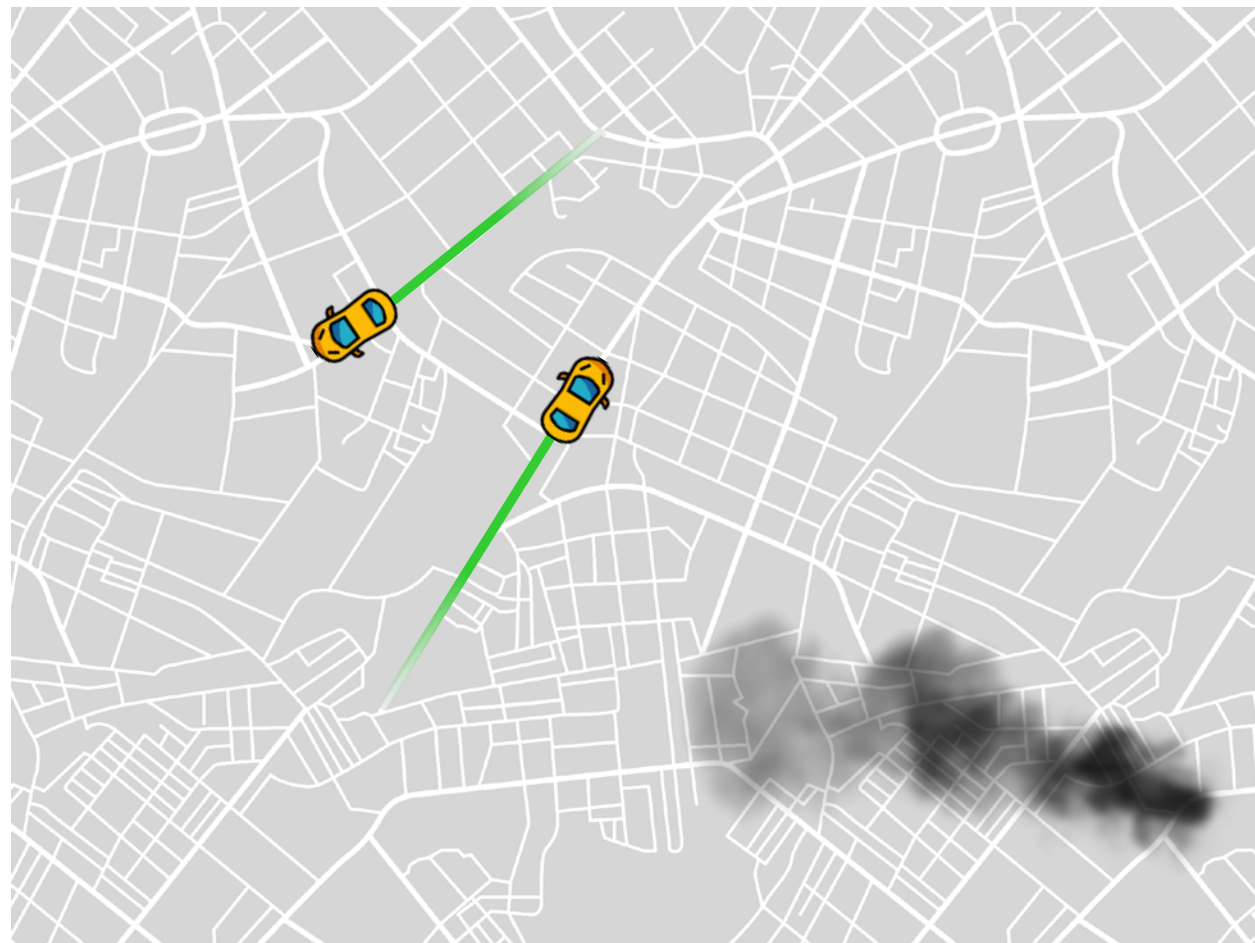




## STATIONARY VS. MOBILE MONITORING



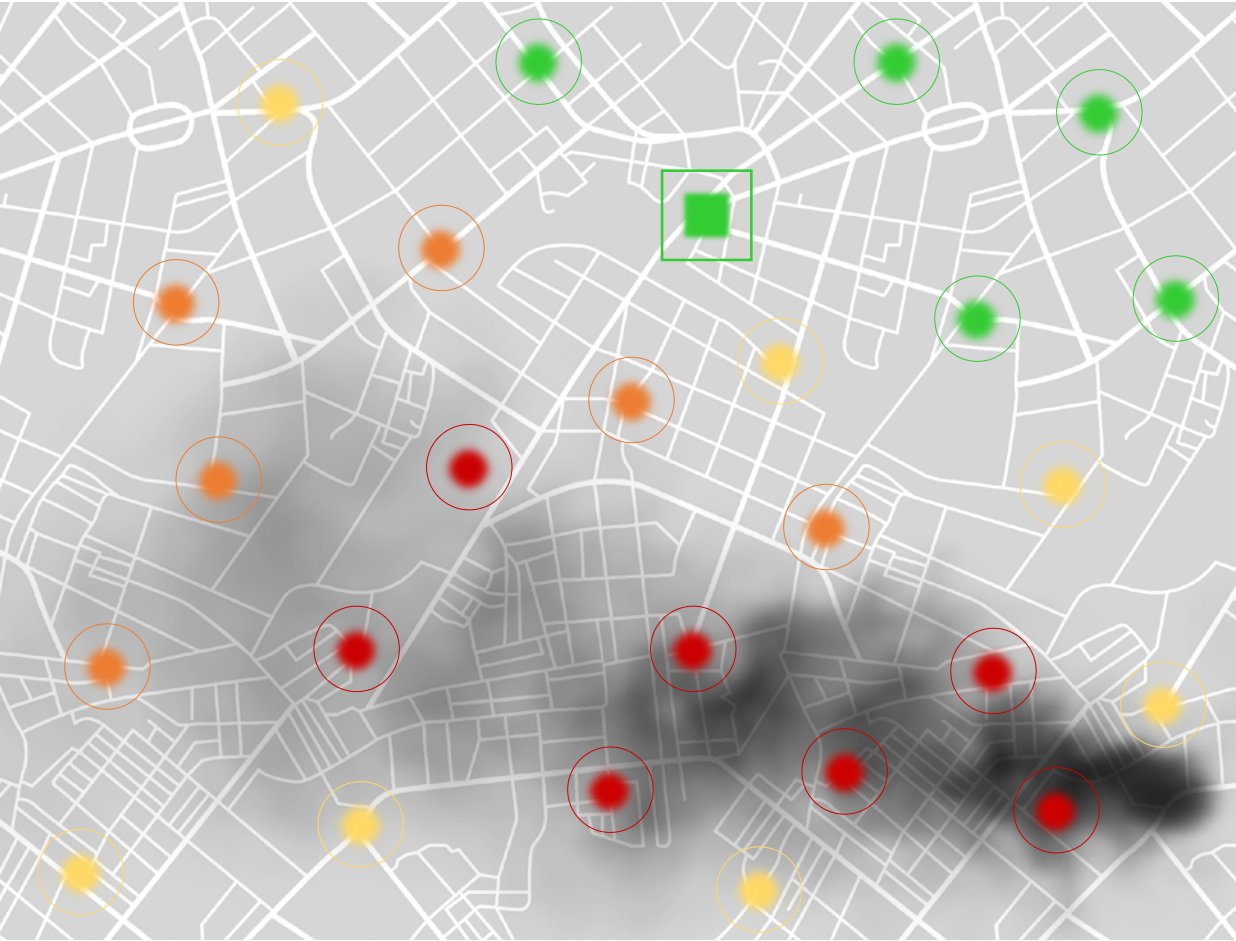
**STATIONARY**



**MOBILE**



## STATIONARY VS. MOBILE MONITORING



**STATIONARY** Stationary monitoring captures pollution events in real-time.



**MOBILE** Mobile monitoring cannot capture full air quality issues in space and time.



## THE PROBLEM (CONTINUED)

“If you can’t measure it, you can’t manage it, and you can’t fix it.”

Clean solutions already exist.

We’re just not deploying them fast enough.



“...& COSTS THE GLOBAL ECONOMY  
MORE THAN \$5 TRILLION ANNUALLY IN  
WELFARE COSTS.”

WORLD BANK +  
INSTITUTE FOR HEALTH METRICS & EVALUTION

## Problem:

We rarely (if ever) procure solutions or legislate  
at a global scale.

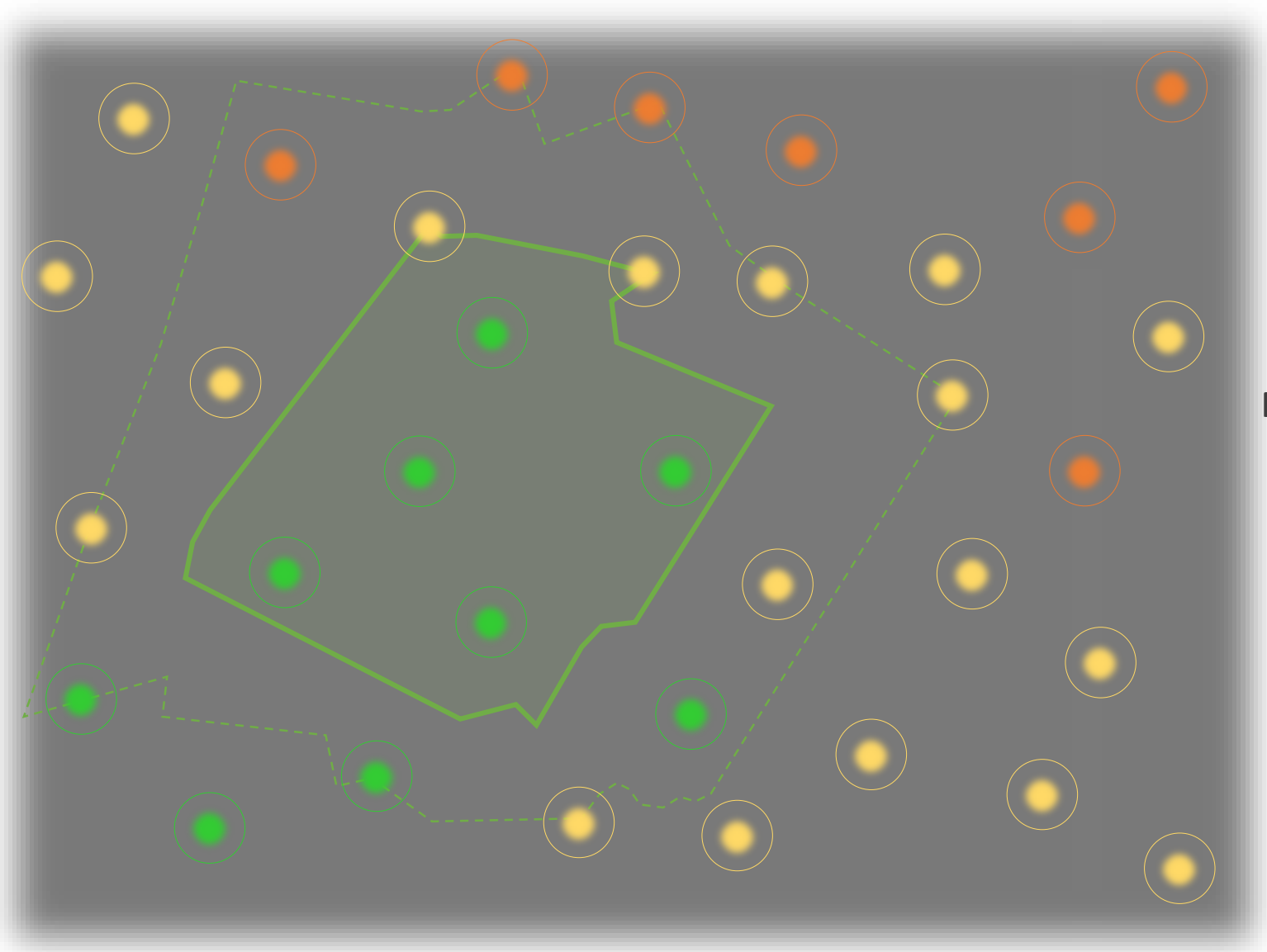
We can do a much better job of measuring  
the localized emissions benefits of  
renewables and zero emission solutions.

**This is where we need your help!**

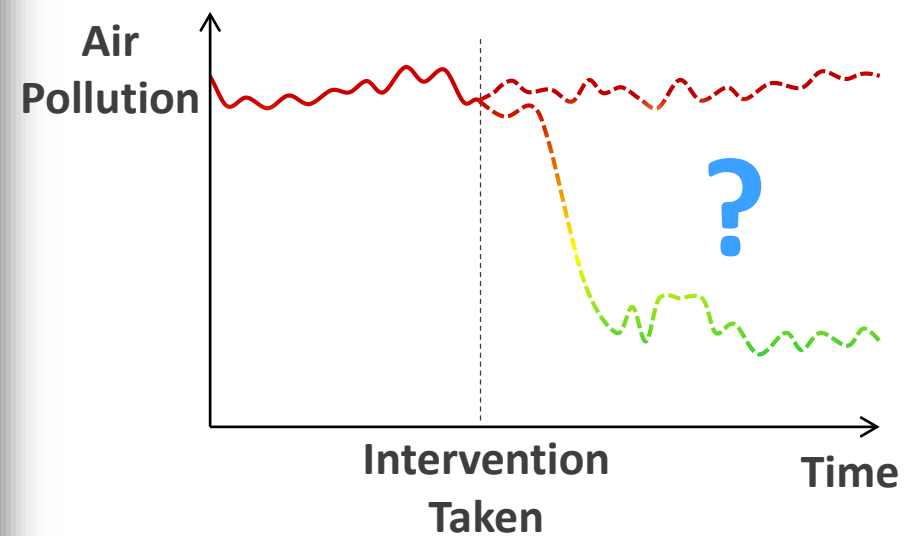


We can cost-effectively **measure** health cost savings and reduced burden of disease at the actual scale of procurements and policies.

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



### CHANGE IN AIR QUALITY AFTER CAR FREE ZONE IMPLEMENTED



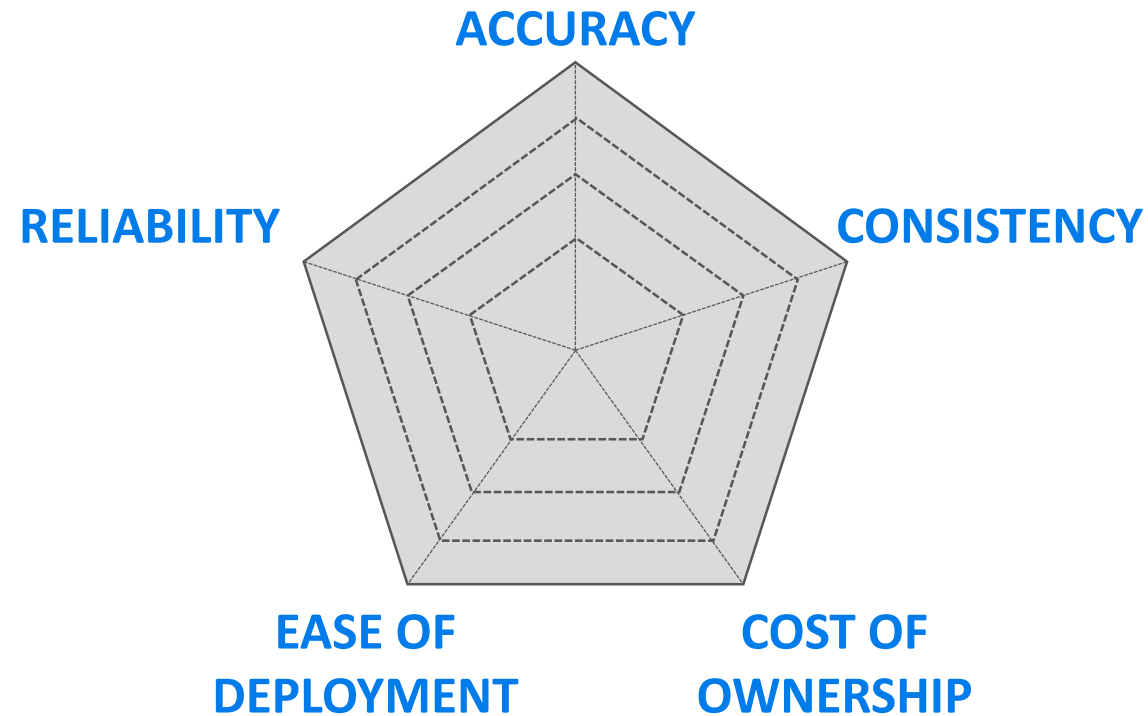
List of air pollutants and greenhouse gases			
	Air Pollutant	Greenhouse Gas	Impacts Human Health
Particulate Matter (PM2.5)	✓	✗	✓
Sulphur Dioxide (SO2)	✓	✗	✓
Nitrogen Dioxide (NO2)	✓	✗	✓
Ozone (O3)	✓	✓	✓
Carbon Monoxide (CO)	✓	✗	✓
Carbon Dioxide (CO2)	✗	✓	✗
Black Carbon (BC)	✓	✓	✓
Lead	✓	✗	✓
Particulate Matter (PM10)	✓	✗	✓
Methane	✓	✓	✓
Source(s): UN Environment; BBC "Cut air pollution to fight climate change – UN" (Sept. 20, 2019)			

We can trust people to act in their self-interest much more urgently than they would for strangers or future generations.



## WHAT IS PERFORMANCE?

(From a system perspective)





# ACCURACY

**PROJECT LOCATION:** Paris, France  
**DATA USE CASE:** Exposure study and modelling  
**MAIN REQUIREMENT:** Good accuracy





# ACCURACY

PROJ  
DATA U  
MAIN



## CLARITY NODE-S

Usage pour lequel l'évaluation était la meilleure : surveiller la qualité de l'air extérieur

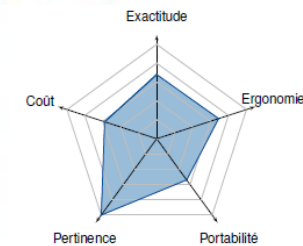
Avis du jury 2018

★★★★☆

Ce capteur multi polluant est conçu pour mesurer la qualité de l'air extérieur. La qualité des données est satisfaisante pour le  $\text{NO}_2$  et les  $\text{PM}_{2.5}$ . Un algorithme Smart Calibration est disponible, élaboré à partir du réseau de surveillance de référence. Il manque néanmoins les particules  $\text{PM}_{10}$  et l'ozone pour une surveillance en air extérieur plus complète. L'appareil est facile à installer, discret mais avec un design agréable, et la possibilité d'installer un panneau solaire est un plus. Il est toutefois important de bien lire préalablement la notice avant de configurer et de lancer la mesure. Quelques pertes de données ont pu être observées sur l'une des stations.



### Évaluation



Usages évalués :

- en air extérieur
- en air intérieur
- en mobilité

### Polluants mesurés

- ☒  $\text{NO}_2$  ( $\text{NO}_x$ )
- ☐  $\text{CO}_2$
- ☐ TSP
- ☐ Particules  $\text{PM}_{10}$
- ☒ Particules  $\text{PM}_{2.5}$
- ☐ Particules  $\text{PM}_1$
- ☐  $\text{O}_3$
- ☐ Formaldéhyde
- ☐  $\text{COV}$
- ☐  $\text{SO}_2$
- ☐  $\text{CO}$
- ☐ Particules en nombre

### Autres mesures

- ☒ Température
- ☐ Pression
- ☒ Humidité
- ☐ Luminosité
- ☐ Bruit
- ☐ Odeurs



# EXACTITUDE sur trois capteurs, à partir de la méthode SET (Fishbain & al. 2017)



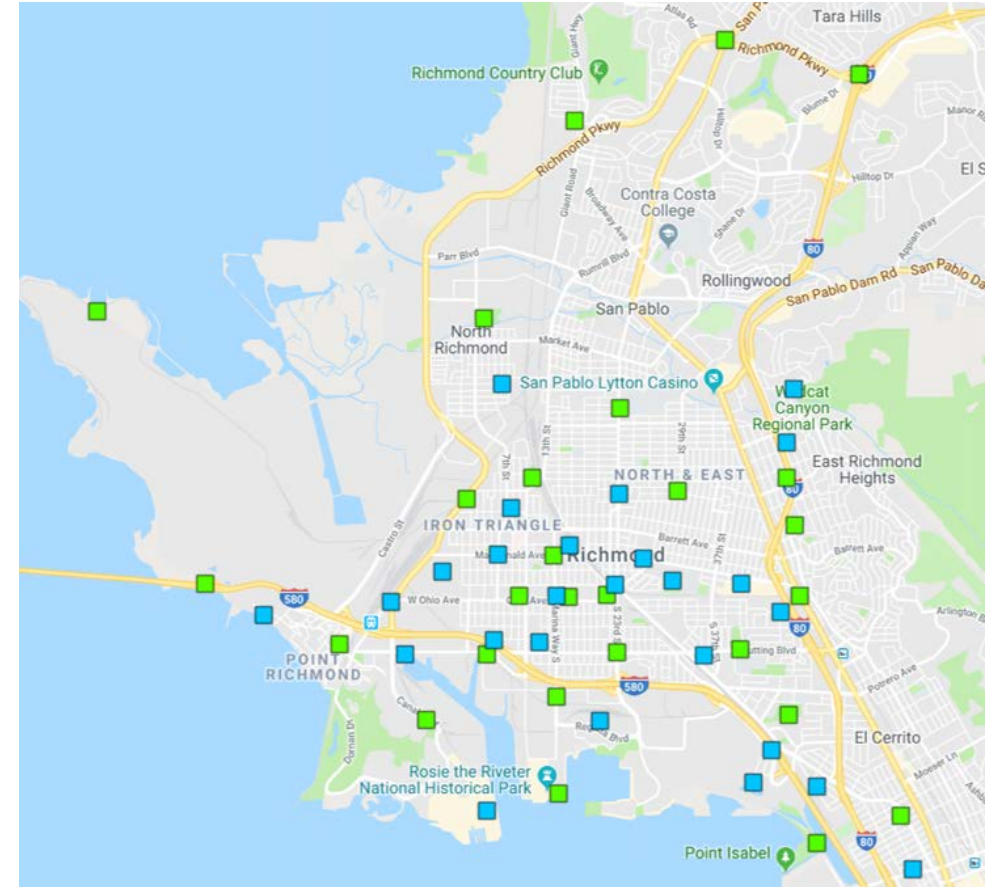


# CONSISTENCY

**PROJECT LOCATION:** Richmond, CA

**DATA USE CASE:** Hotspot detection

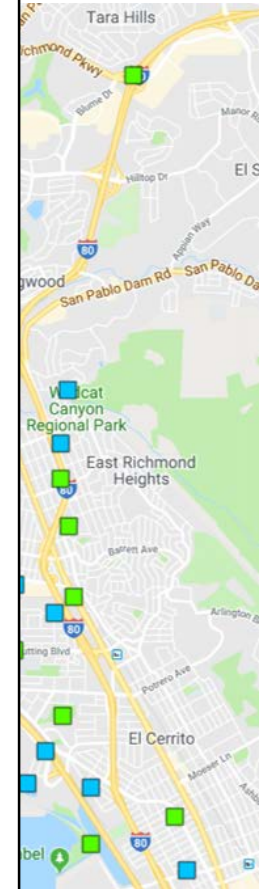
**MAIN REQUIREMENT:** Good device-to-device consistency





# CONSISTENCY

PROJECT LO  
DATA USE CA  
MAIN REQU

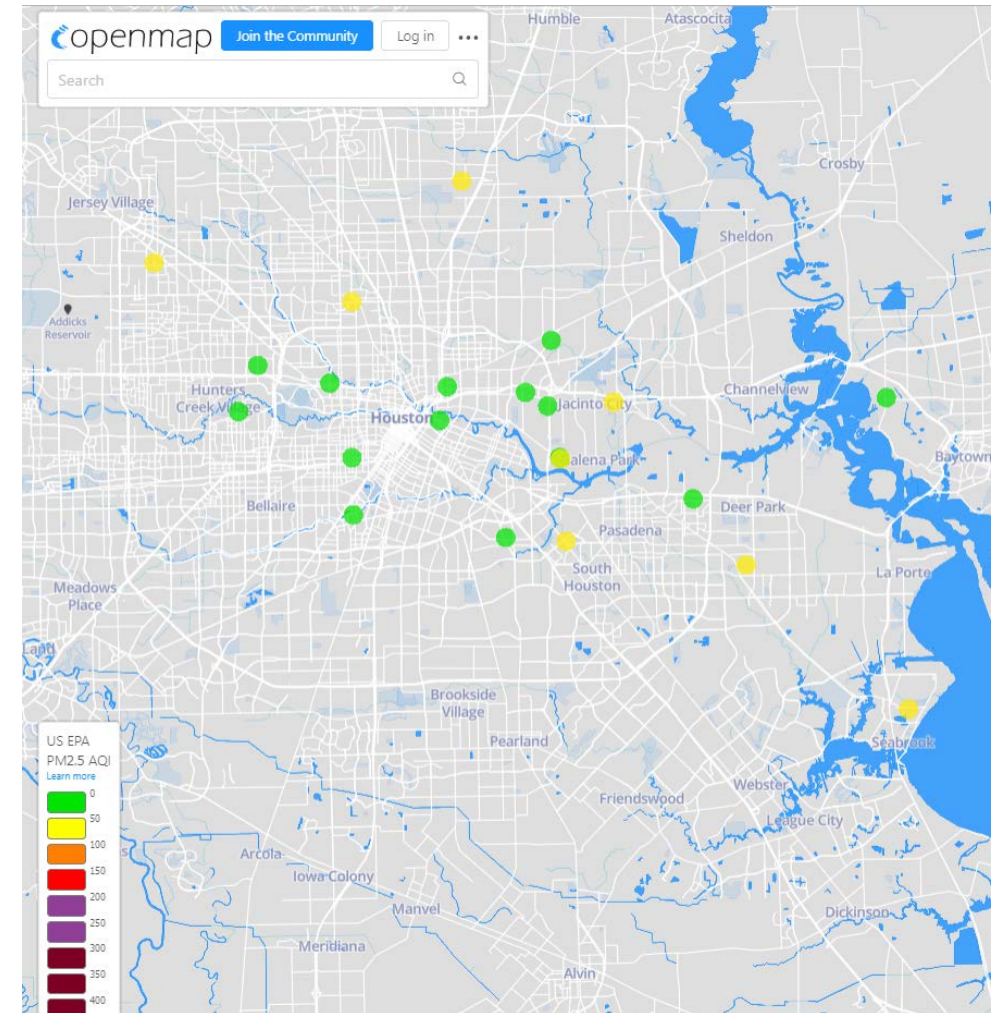






# EASE OF DEPLOYMENT

**PROJECT LOCATION:** Houston, TX  
**DATA USE CASE:** Emergency response  
**MAIN REQUIREMENT:** Fast deployment

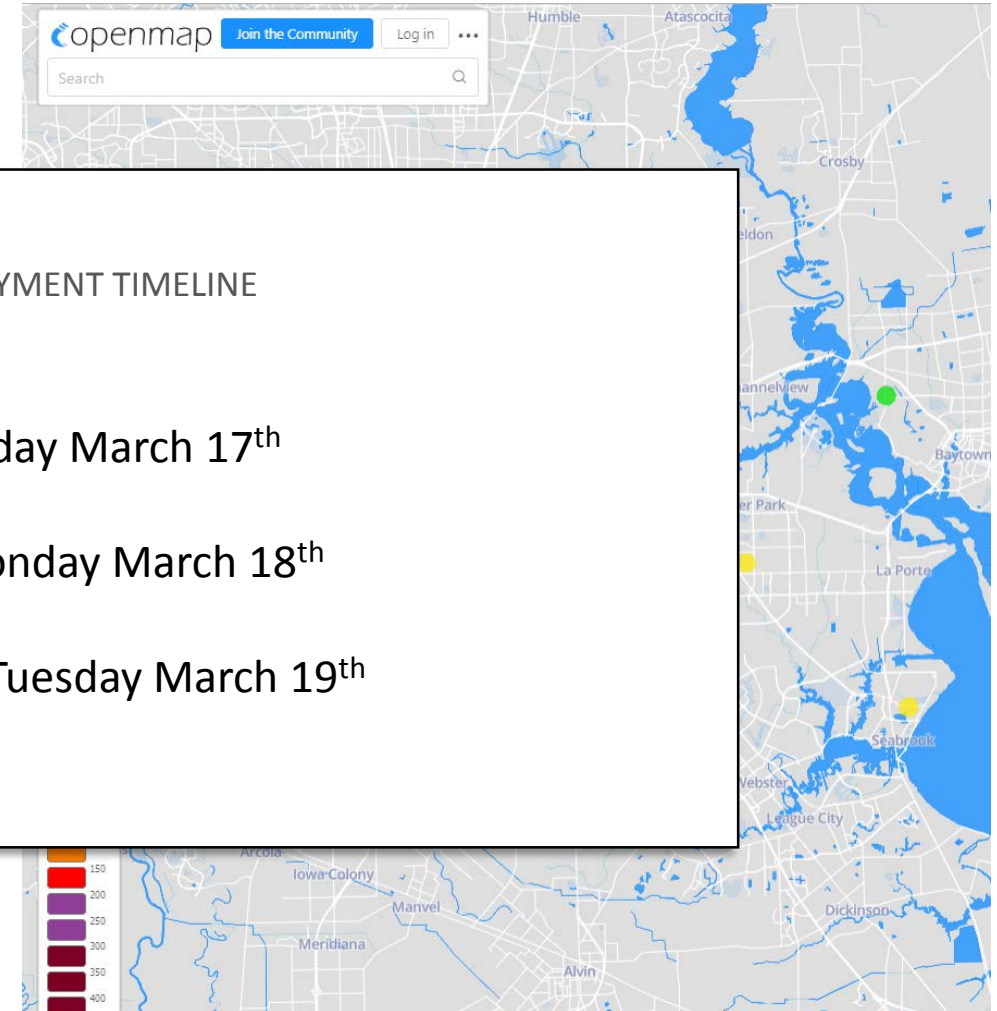
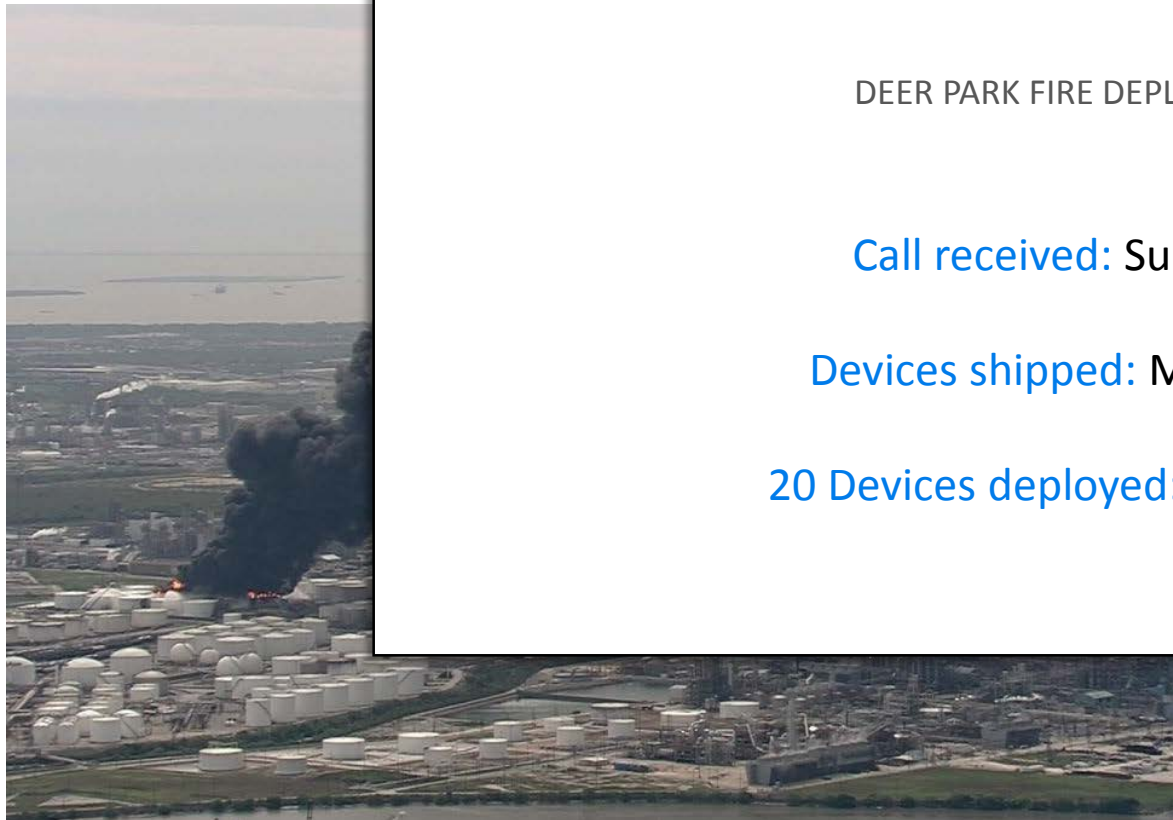


# EASE OF DEPLOYMENT

**PROJECT LOCATION:** Houston, TX

**DATA USE CASE:** Emergency response

**MAIN REQUIREMENT:** Fast deployment



## DEER PARK FIRE DEPLOYMENT TIMELINE

**Call received:** Sunday March 17<sup>th</sup>

**Devices shipped:** Monday March 18<sup>th</sup>

**20 Devices deployed:** Tuesday March 19<sup>th</sup>

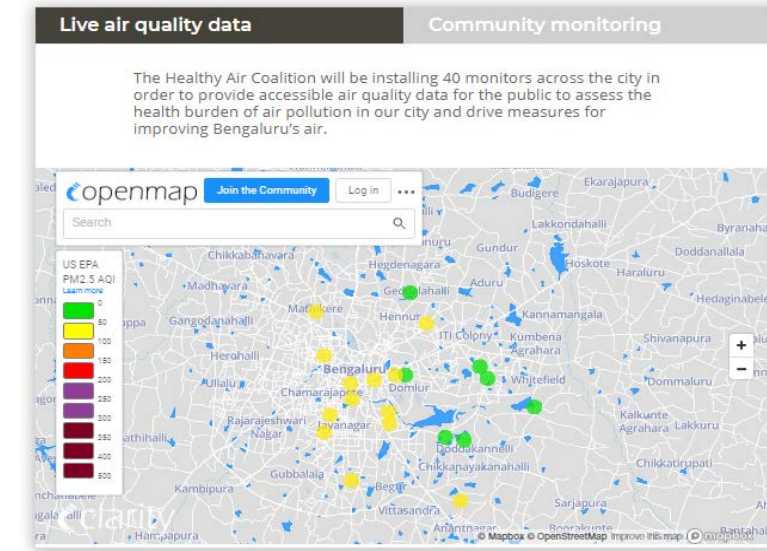


# COST OF OWNERSHIP

**PROJECT LOCATION:** Bengaluru, India

**DATA USE CASE:** Awareness generation

**MAIN REQUIREMENT:** Low cost of ownership



## Healthy Air Coalition Bengaluru calls for urgent action on air pollution.

Bengaluru's healthy air coalition, brings together health researchers, heart and lung doctors, public health institutes and patients, concerned about the health risks from Bengaluru's poor air quality. We come together to collaborate on air monitoring initiatives with different communities in the city; to share information and communicate about air pollution & health; to build the capacity of fellow health professionals; and to provide expertise input for air pollution control and reduction measures.

We invite doctors, public health practitioners, researchers, concerned patients and citizens to join the healthy air coalition in Bengaluru. Together, we can achieve air quality that remains within the

**HEALTHY AIR COALITION Bengaluru**

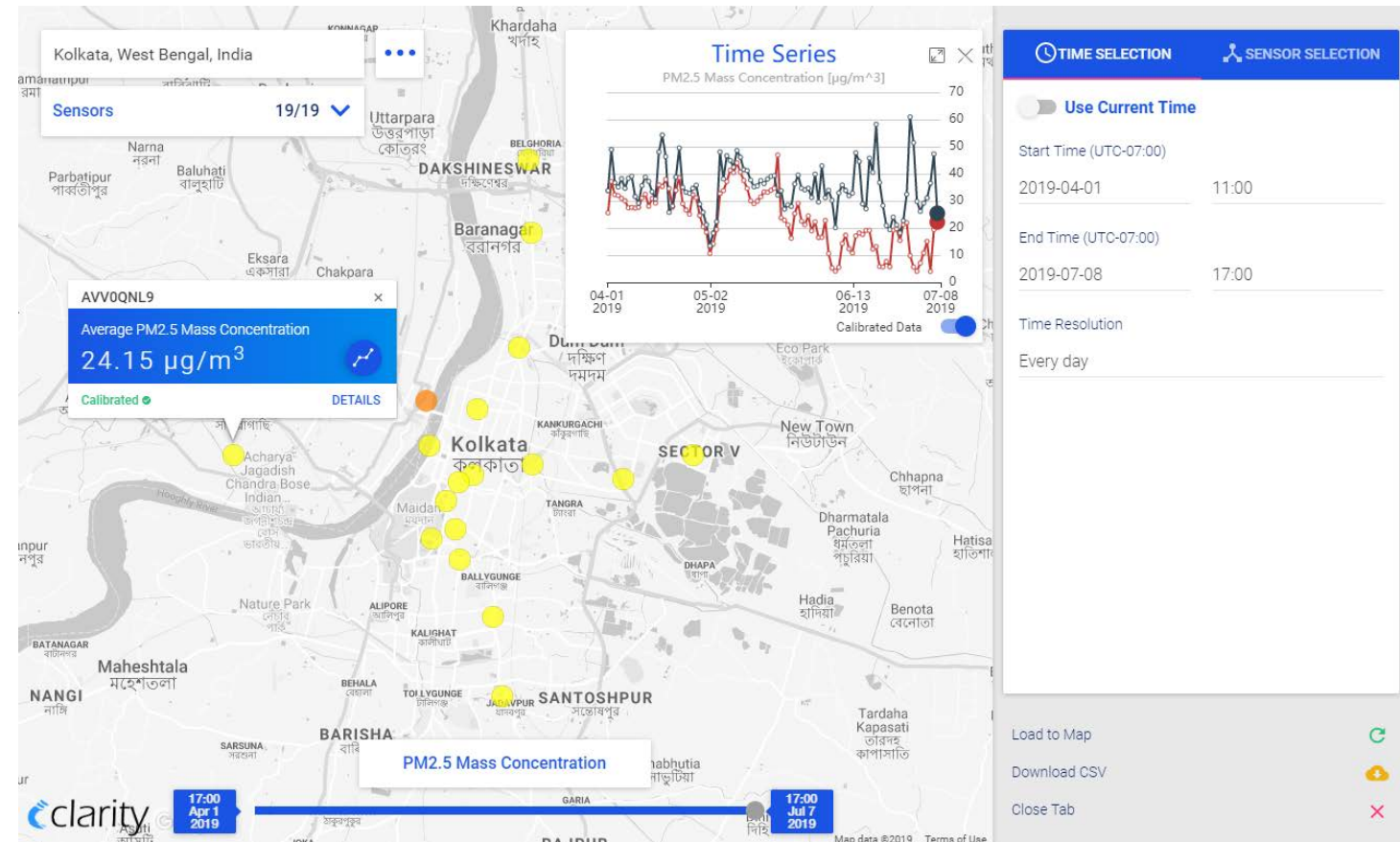
Maternity ward and health service gathers real time air quality data to assess the health burden of air pollution on their patients.

# RELIABILITY

PROJECT LOCATION: Kolkata, India

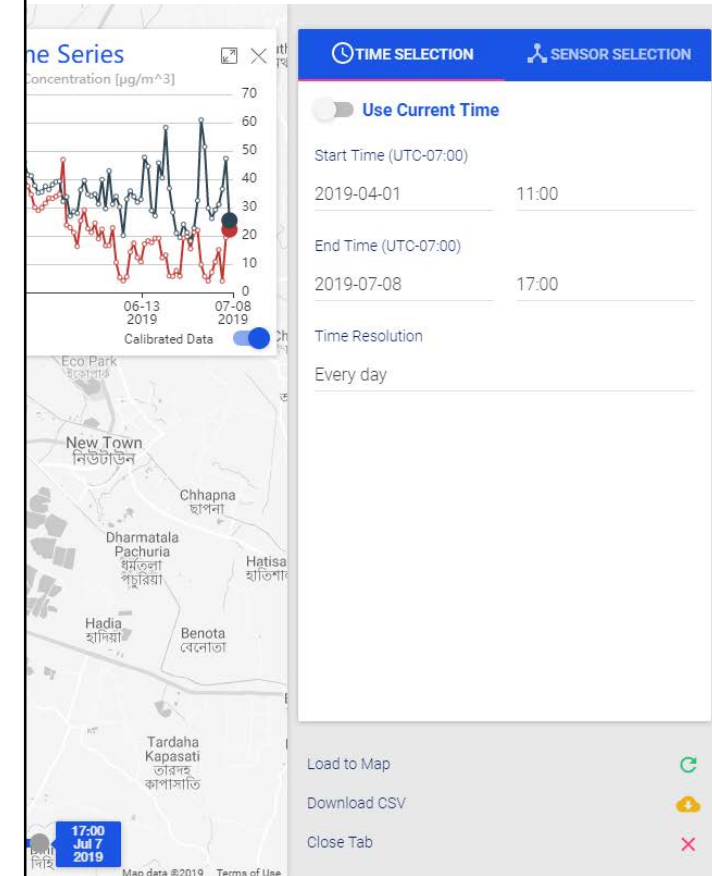
DATA USE CASE: Policy impact analysis

MAIN REQUIREMENT: Reliability



# RELIABILITY

**PROJECT LOCATION:** Kolkata, India  
**DATA USE CASE:** Policy impact analysis  
**MAIN REQUIREMENT:** Reliability



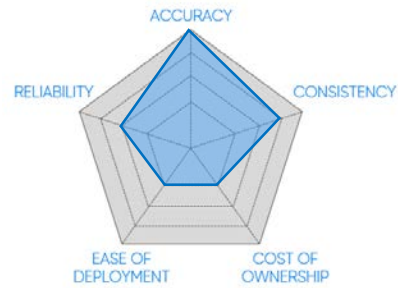




# CONCLUSION

## PERFORMANCE STANDARDS OF A SYSTEM Depend on use case of generated data

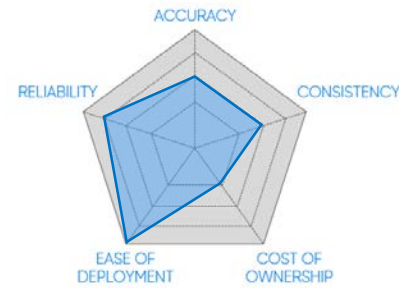
### EXPOSURE STUDY AND MODELLING



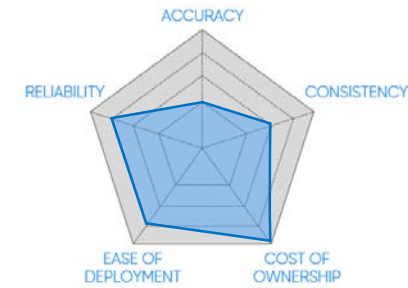
### HOTSPOT DETECTION



### EMERGENCY RESPONSE



### AWARENESS GENERATION



### POLICY IMPACT ANALYSIS





## CLARITY MOVEMENT

<sup>CAN</sup>  
“IF YOU ~~CAN’T~~ MEASURE IT, YOU ~~CAN’T~~ —  
MANAGE IT, AND YOU ~~CAN’T~~ ~~FIX~~ IT.”  
<sup>CAN</sup>

-CLARITY TEAM



THANK YOU! LEARN MORE AT [CLARITY.IO](https://clarity.io)

