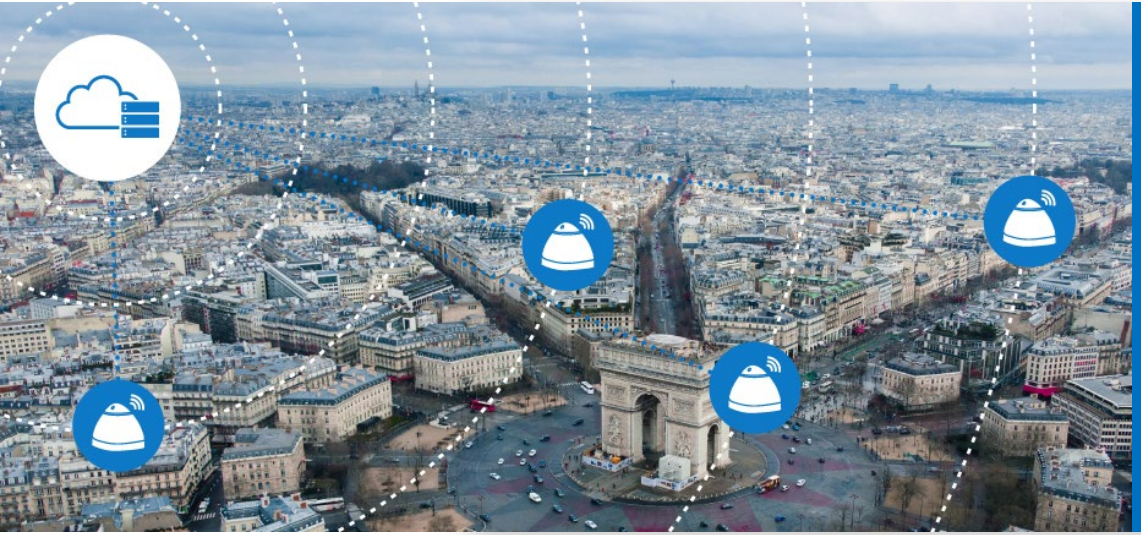

Considerations when deploying a sensor-based air quality network

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- Air quality sensor-based systems: Challenges and Issues
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AIR QUALITY SENSOR-BASED SYSTEMS– ISSUES & CHALLENGES

WORLD METEOROLOGICAL ORGANIZATION

Quality Assurance (QA) - **appropriate calibration** ensures that data monitored are robust and accurate.

Quality Control (QC) - monitoring the long-term performance to ensure it **remains calibrated** and **help notify the user** when it needs to be corrected, removed or re-calibrated.

Snyder et al., 2013 "Data of poor of unknown quality is less useful than no data since it can lead to wrong decisions".

AIR QUALITY SENSOR-BASED SYSTEMS– ISSUES & CHALLENGES

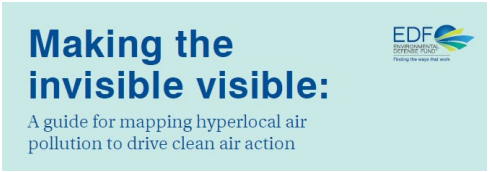
WORLD METEOROLOGICAL ORGANIZATION

- Important to develop and refine new **scalable calibration and quality control approaches**.
- Proper **QA&QC procedures allow users to better understand the quantitative capabilities** and are resource-efficient → keep the overall cost of the network operation low.
- **Developing, optimizing, and refining advanced techniques for sensor calibration and validation** is essential to obtain reliable and meaningful data.

CONSIDERATIONS - AQ NETWORK

Correct installation and **maintenance** to ensure the proper performance of the devices and the quality of the data.

- ✓ **Usability** → easy of use, reduced maintenance
- ✓ **Portability** → autonomy, mass and volume (Form factor)



Two major questions arise when you start designing your monitoring effort: What sensor systems should you use? and What monitoring approach should you take?

SELECTING MONITORING EQUIPMENT

The monitor sensors you choose to add to your network will depend on:

- the pollutant(s) you want to measure
- the data quality
- the budget you can devote to purchase and maintain the equipment.

CONSIDERATIONS - AQ NETWORK

kunak air PRO

kunak air LITE

- Easy & Fast installation
- Cartridges system
- Proven accuracy
- Easy calibration
- Air quality platform
- Multi pollutant
- Fully autonomous
- Real-time data
- Add environmental sensors

Examples:

- Solar Panel vs. Main Electrical Network
- Solar Panel Dimensions
- Easy&Fast installation vs. Difficult deployment in field

CONSIDERATIONS - AQ NETWORK

USES CASES - Spain

Devices: 10 Kunak AIR Pro stations + sound level meters + information screens

Measurement parameters:
- SO_2 ,NO_x, O_3,CO and particles (PM1, PM2.5 and PM10)
- Noise level.
- Temperature, relative humidity and atmospheric pressure.
- Wind speed and direction.

CHALLENGES	SOLUTIONS
• AQ data diffusion to citizens	• AQ data accessible from web portal and screens.
• Civil engineering work. Poles installation.	• National Project
• Public electrical network spots	• Powered by public electric bikes chargers
• Lack of concern about the O&M of the network	• Operation and Maintenance Service in remote
• Public tender – fixed price	• Price not adaptable for improvements

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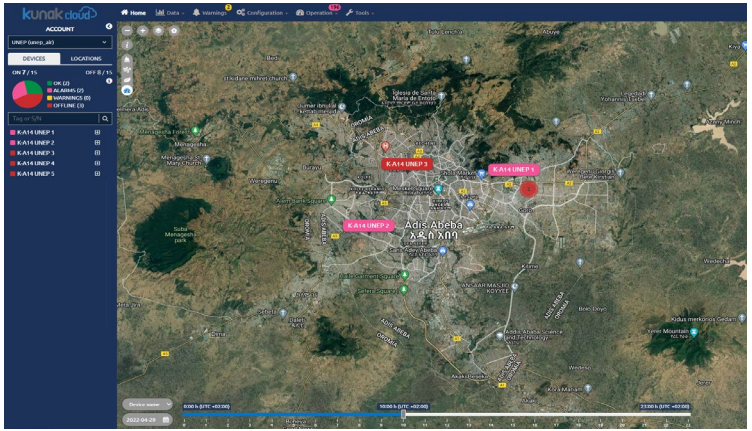
CONSIDERATIONS - AQ NETWORK

USES CASES - Ethiopia

Devices: 5 Kunak AIR A14 stations

Measurement parameters:
- NO_2, O_3 and particles (PM1, PM2.5 and PM10)
- Temperature, relative humidity and atmospheric pressure.
- Wind speed and direction.



CHALLENGES	SOLUTIONS
• Not Official Reference Stations	• Factory calibration against reference standards
• High temperature and humidity conditions	• Remote baseline and sensitivity correction
• Low budget	• Kunak temp/RH correction algorithm
	• Automatic maintenance of the network (not technician hours)

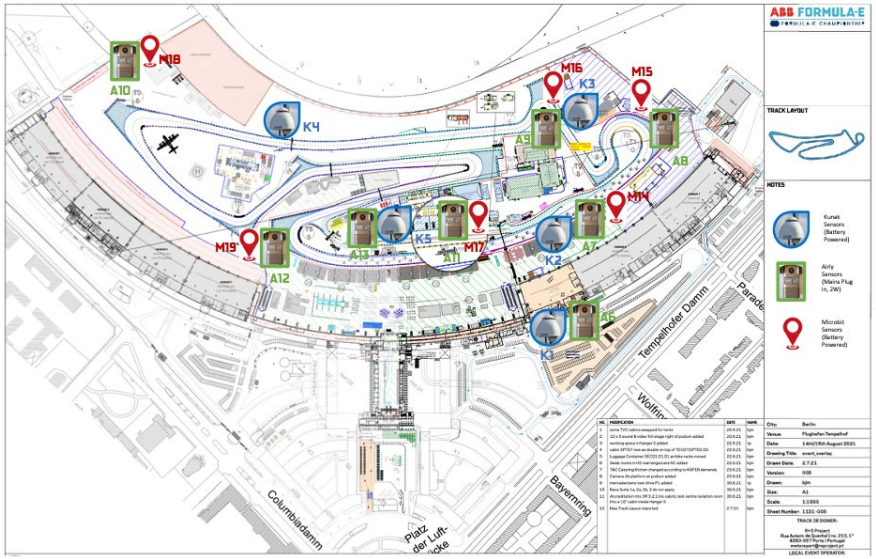
UN environment
United Nations Environment Programme

CONSIDERATIONS - AQ NETWORK

USES CASES – Formula E (Germany)

Devices: 5 Kunak AIR PRO stations

Measurement parameters:
- CO, NO_2, O_3, SO_2 and particles (PM1, PM2.5 and PM10)
- Temperature, relative humidity and atmospheric pressure.
- Wind speed and direction.



CHALLENGES	SOLUTIONS
• Fast deployment (1 week project)	• Plug&Play installation
• Electrical network not fully accessible	• Solar panel (small dimensions)
• Not RS data for calibration	• Factory calibration against reference standards
• Pilot Project (low budget)	• Remote baseline and sensitivity correction

FORMULA E

ABB FORMULA E
FIA WORLD CHAMPIONSHIP

Session 5D: Standard, Supplemental and Informational Monitoring
Friday 13th May - 9:50 AM-12:10 PM

How can non-exhaust motorsports events improve urban air quality in cities with hyper-local monitoring?

CONSIDERATIONS - AQ NETWORK

USES CASES - India

Devices: 5 Kunak AIR PRO stations
Official Air Quality Stations

Measurement parameters:
- CO, NO_2, O_3, SO_2 and particles (PM1, PM2.5 and PM10)
- Temperature, relative humidity and atmospheric pressure.
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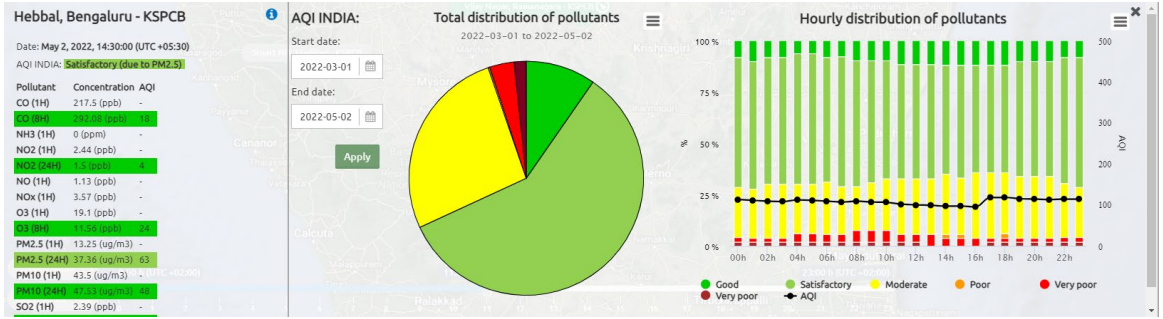
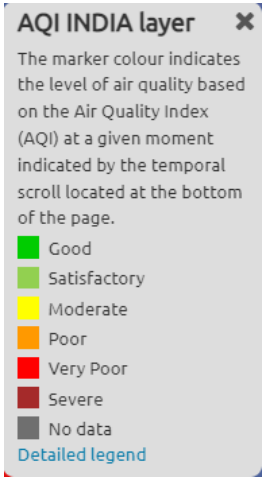


CHALLENGES	SOLUTIONS
• Temperature >40ºC	• Kunak temp/RH correction algorithm
• AQ data diffusion to citizens	• RS web widget development
• New country	• Local partner help



CONSIDERATIONS - AQ NETWORK

Air quality platform

- **Visualize the operation** of the equipment and the data obtained → to monitor the health of the network and the status of the devices.
- **Detect errors and anomalies** in the devices and data **immediately**, consult them, and invalidate the data if needed.
- **Detect** that the gas and particle sensors need **calibration** and allow the **calibration remotely**.
- Availability of a validation tool for **validating and invalidating the data remotely**, to have reliable data for advanced analysis.
- A **Computer-based Maintenance Management System** → to facilitate network maintenance.
    - maintenance tasks
    - uploading of images and documents
    - access to configuration history, logbook, etc.

CONSIDERATIONS - AQ NETWORK

Advanced platform for air quality networks remote management and noise levels analysis

- Data visualization
- Data integration
- Remote device configuration
- Warnings and alarms
- Calibration tools
- CMMS (Computerized maintenance management system)
- Validation tool
- Analysis tool
- Automatic reports

CONSIDERATIONS - AQ NETWORK

USES CASES - Spain

Devices: 10 Kunak AIR Pro stations + sound level meters + information screens

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- Noise level.
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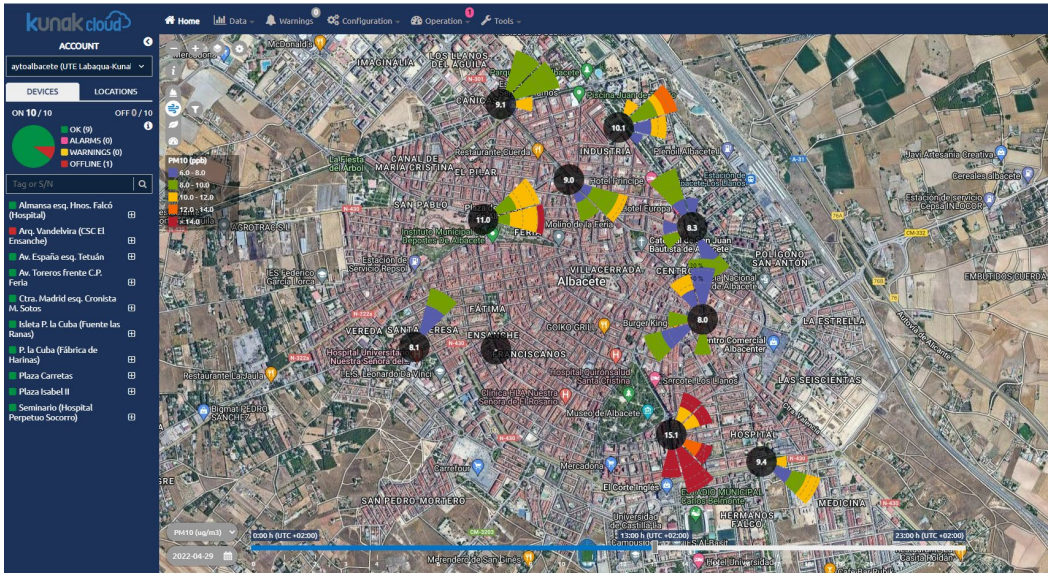
Data Visualization



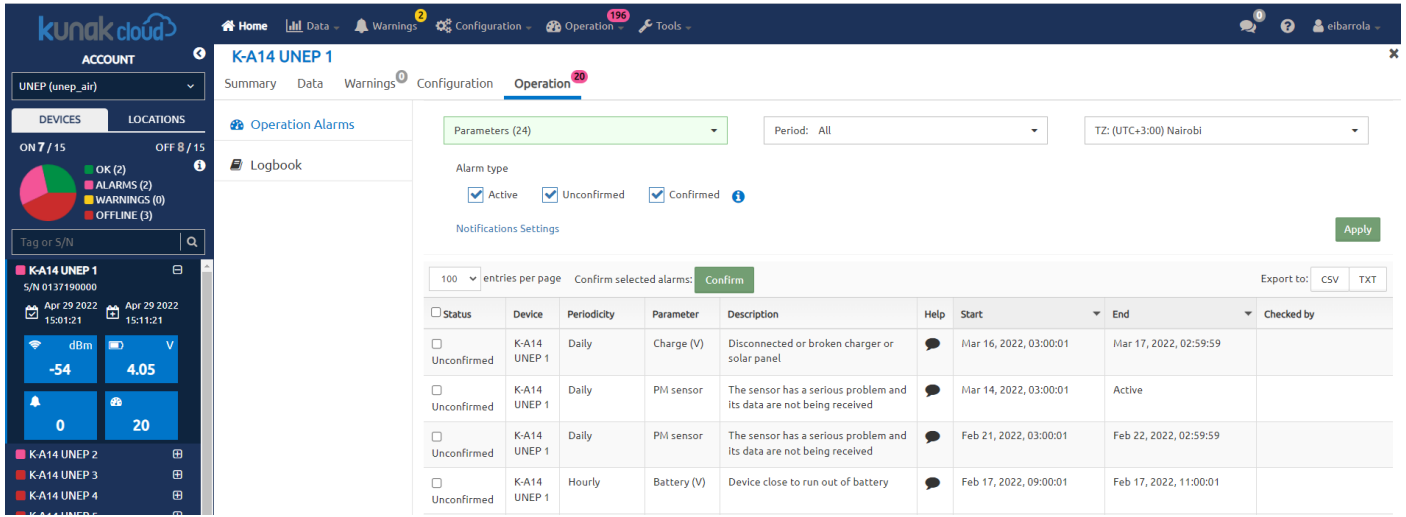
CONSIDERATIONS - AQ NETWORK

USES CASES - Ethiopia

Devices: 5 Kunak AIR A14 stations

Measurement parameters:
- NO_2, O_3 and particles (PM1, PM2,5 and PM10)
- Temperature, relative humidity and atmospheric pressure.
- Wind speed and direction.

Warnings and alarms



CONSIDERATIONS - AQ NETWORK

USES CASES – Formula E

Devices: 5 Kunak AIR PRO stations

Measurement parameters:
- CO, NO_2, O_3, SO_2 and particles (PM1, PM2,5 and PM10)
- Temperature, relative humidity and atmospheric pressure.
- Wind speed and direction.

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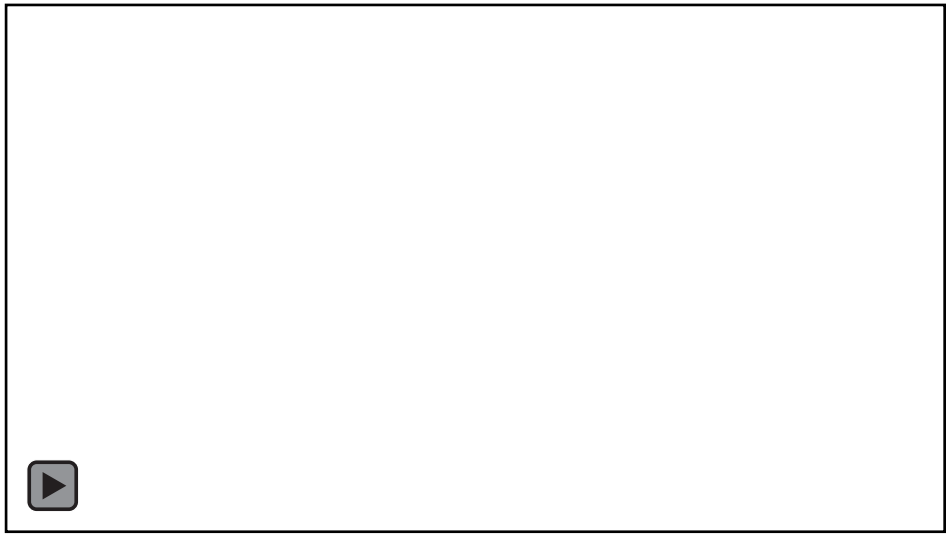
Analysis tool



CONSIDERATIONS - AQ NETWORK

USES CASES - India

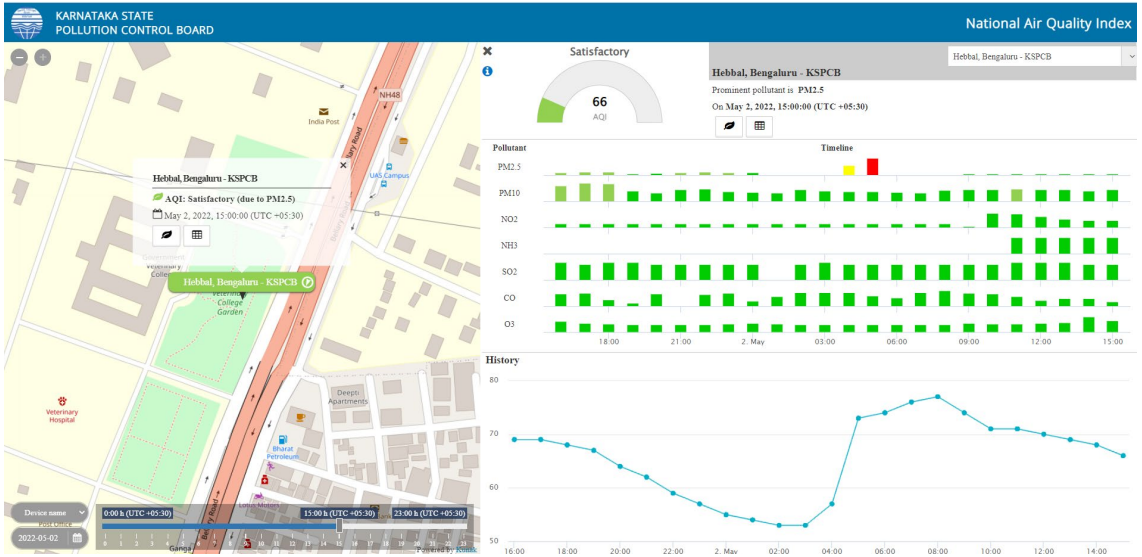
Devices: 5 Kunak AIR PRO stations
Official Air Quality Stations

Measurement parameters:
- CO, NO_2, O_3, SO_2 and particles (PM1, PM2,5 and PM10)
- Temperature, relative humidity and atmospheric pressure.
- Wind speed and direction.

acoem India

Pollution Control Board KARNATAKA

Data integration



https://kunakcloud.com/dashboards/india/karnataka.html

Considerations when deploying a sensor-based air quality network

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