

Air Monitoring Approaches

LONG-TERM, TRENDS MONITORING

- Estimate population exposure and compliance to regulations over long duration
- Highly-accurate measurements
- Understand pollutant composition in an area
- Capture variations in weather & emissions
- Inform other monitoring approaches

SCREENING

- Short duration to cover large areas
- Identify “hot spots” for further investigation

SPECIAL STUDIES

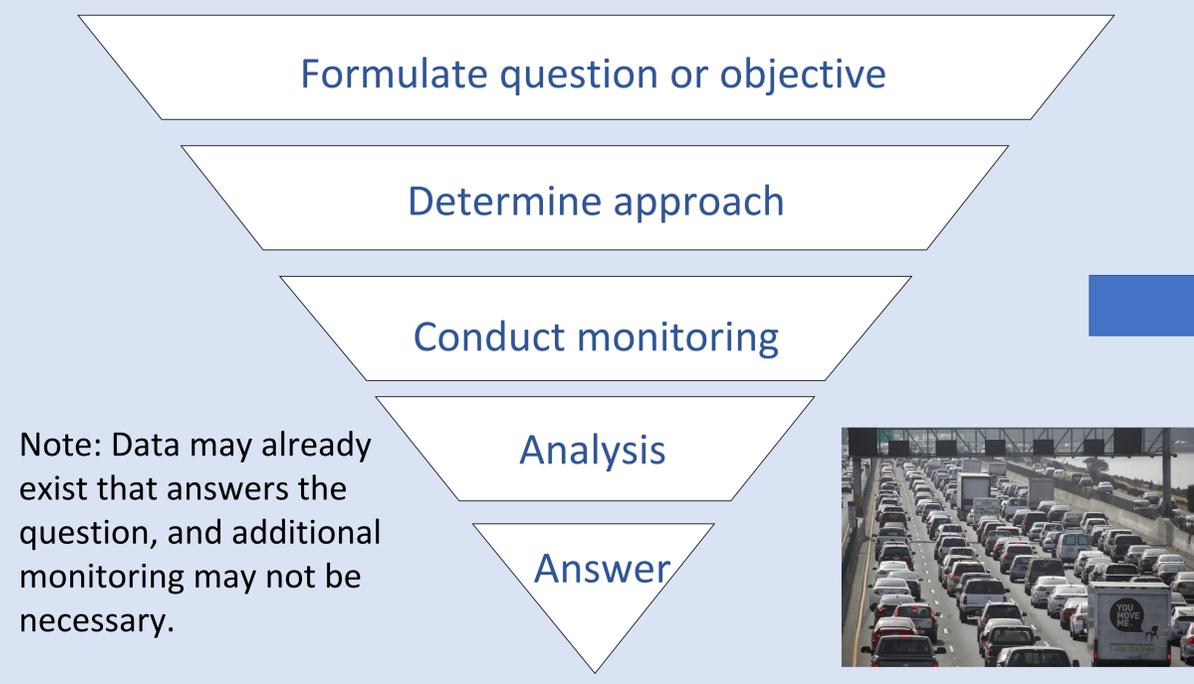
- Investigate emissions from specific sources
- Portable monitoring systems

Factors that Affect Monitoring

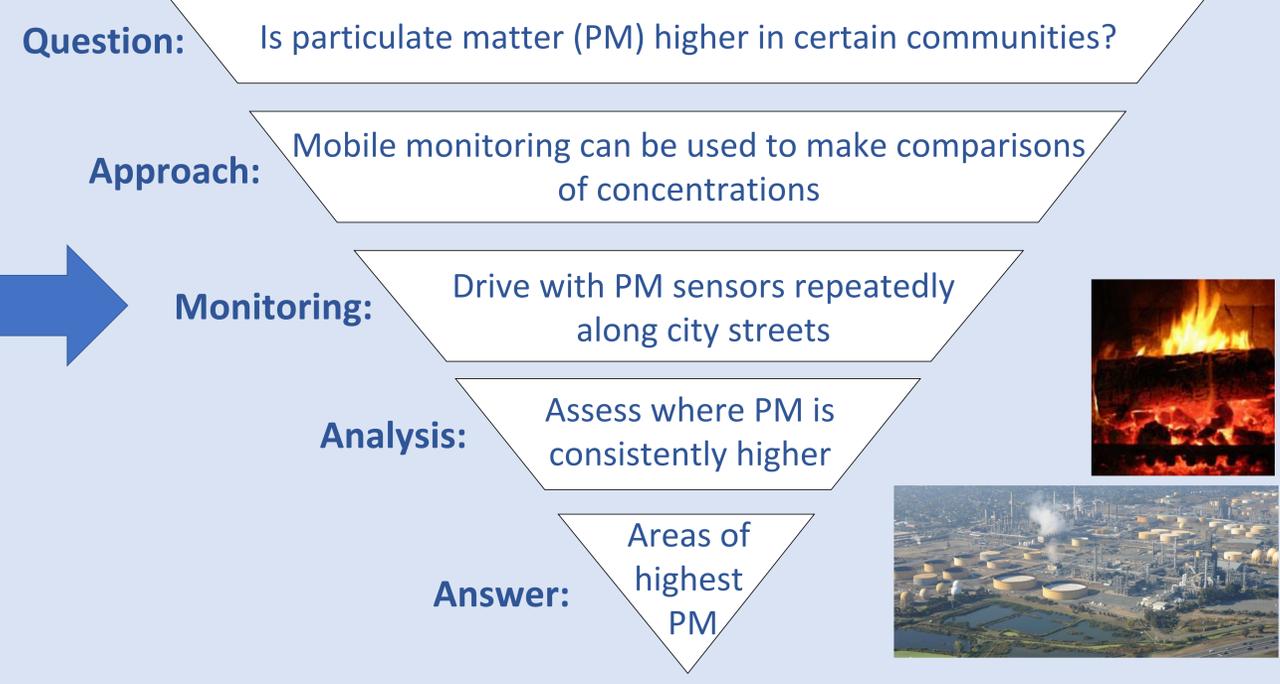
- Location & obstructions
- Distance from sources
- Meteorology & topography
- Interferences (such as other gases, water vapor)
- Logistics such as power, security, and access
- Instrument quality and sample duration



How do we answer air quality questions?



Example



Ways to Conduct Measurements: Air Quality Monitoring Modes

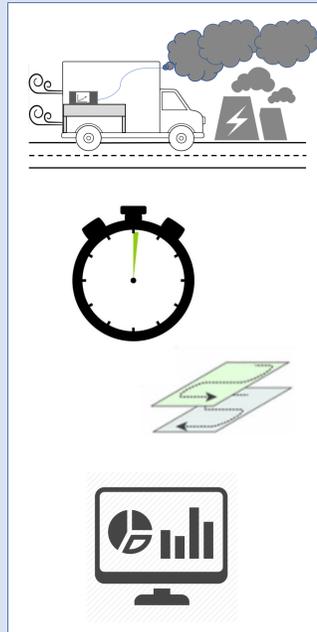
Mobile: Measurements while in motion

Features:

- Screen pollution over a broad area
- Identify pollution “hot spots”
- Help direct resources & additional monitoring efforts

Considerations:

- Only provides a snapshot of pollutants
- Many passes needed for confidence in results
- Large data sets & complicated analysis
- Limited instrumentation



Portable: Stationary for days to weeks

Features:

- Movable, minimal site preparation
- May identify sources
- Medium to high data quality

Considerations:

- Temporary monitoring
- May need access to power
- Instruments need to be easy to transport & deploy



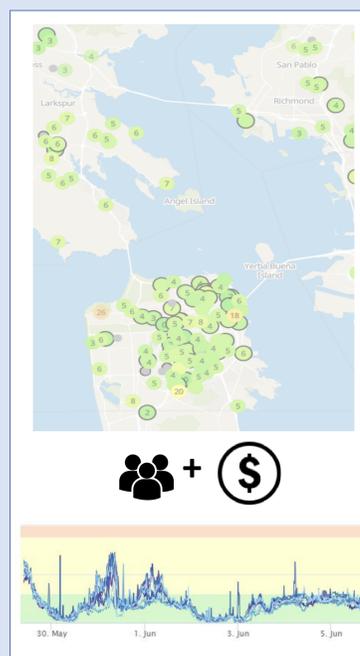
Saturation: Sensor network

Features:

- Stationary, frequent measurements
- Dense spatial coverage
- Can be easy to use and deploy

Considerations:

- Limited pollutants measured
- Significant resources for upkeep
- Lower-quality data



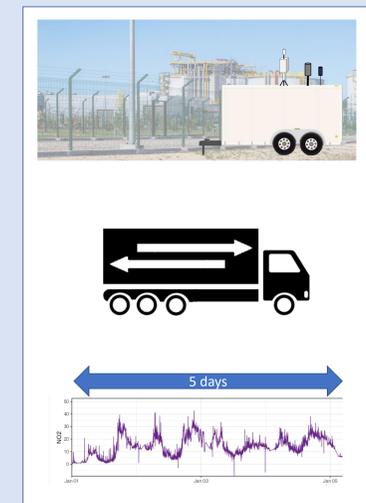
Short-term: Stationary for weeks to months

Features:

- Short-term trends of pollutants
- Wide range of instrumentation
- High quality data

Considerations:

- Siting, power, and security needs
- Low spatial coverage
- Build-out may be costly



Long-term: Stationary for a year or more

Features:

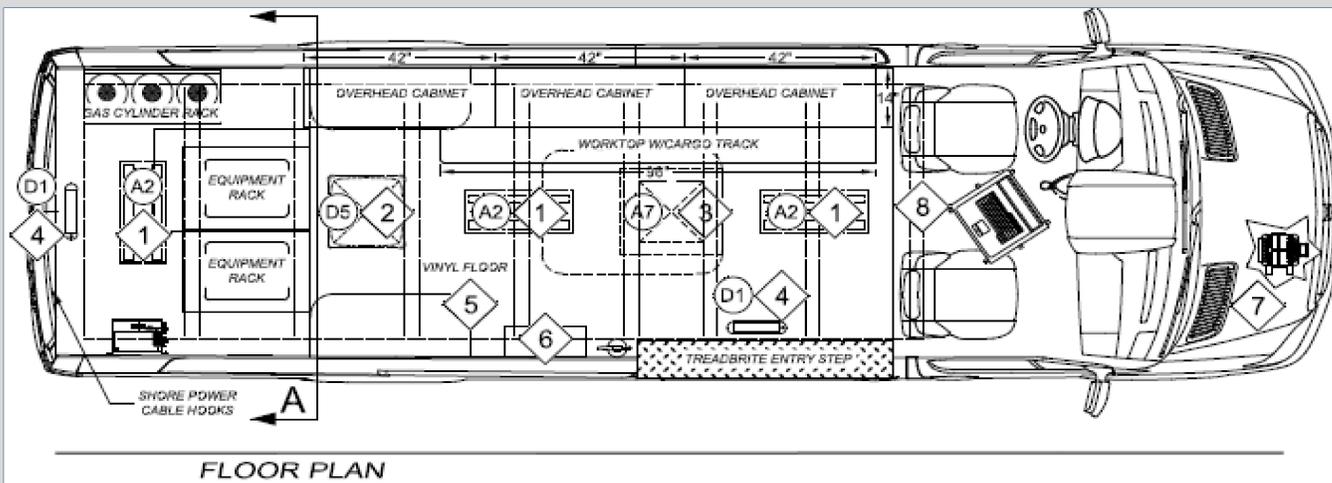
- Long-term trends of pollutants
- Wide range of instrumentation
- High-quality data

Considerations:

- Moving difficult
- Siting, power, security, space needs
- Low spatial coverage
- Costly build-out

Mobile Lab Summary

- General information:
 - Instruments measure either gases or particles
 - Instruments on the passenger side of the van are for gases
 - Instruments on the driver side of the van are for particles
- Gas instruments:
 - Ozone, CO, CO₂, methane, NO/NO_x, volatile organic compounds (VOCs)
- Particle instruments:
 - Particle mass, particle size, black carbon mass



Particle instruments

- TSI Optical Particle Sizer
 - Particle sizes and mass from 0.3 to 10 μm diameter
- TSI Fast Mobility Particle Sizer Spectrometer
 - Particle sizes and mass from 5.6 to 560 nanometers
- Magee Scientific AE33 Aethalometer
 - Black carbon mass measurement



Gas instruments

- Thermo-Scientific 42C model
 - Ozone
- Thermo-Scientific 49C model
 - NO/NO_x
- Picarro G2401
 - CO/CO₂/CH₄
- Ionicon Proton Transfer Mass Spectrometer
 - VOC identification and measurement



Meteorology

- Wind Speed
- Wind Direction
- Solar Irradiance
- Relative Humidity
- Temperature
- Dew point
- Pressure

GPS

- Latitude
- Longitude
- Vehicle heading
- Vehicle velocity

