# *Sub Working Group Outline on* Environmental Monitoring

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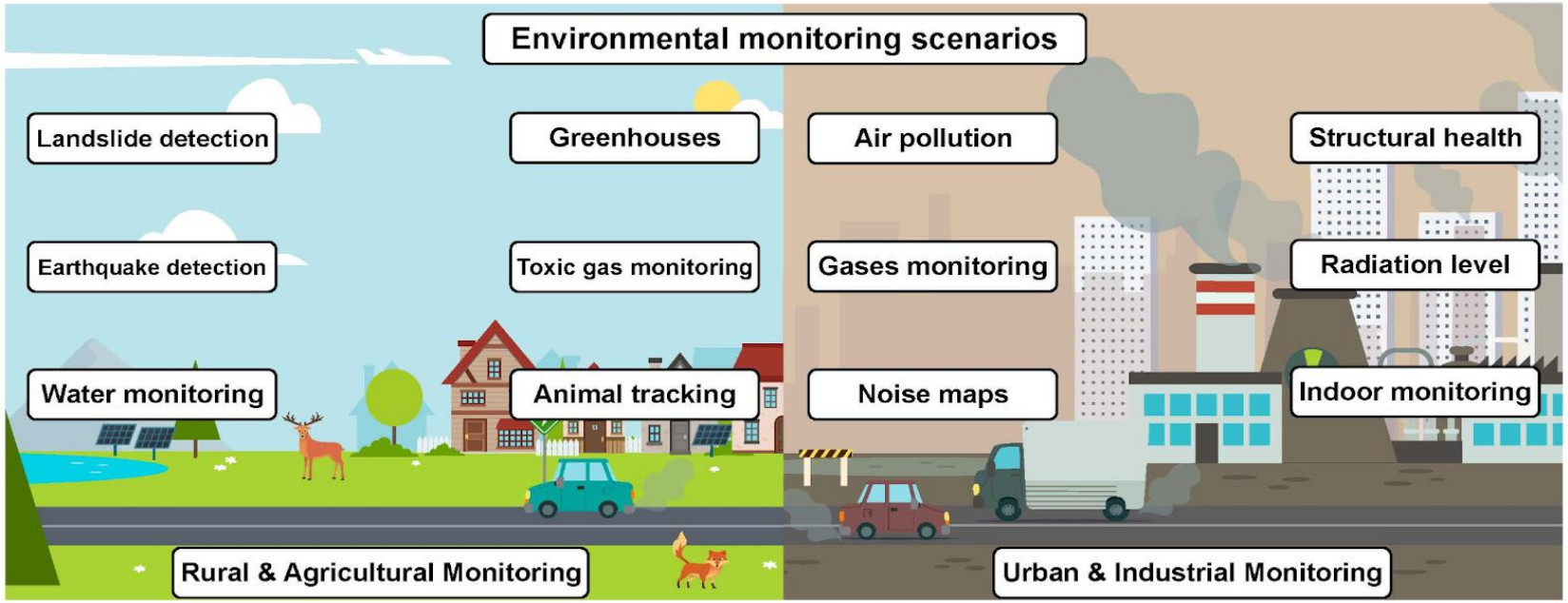
# General Opportunities for IoT Environmental Monitoring




Ometov et al., 2019. https://www.mdpi.com/596678

- **Collection:** centralized/consortium collection of environmental data from remote sensing
  - Example: High resolution, real time air quality monitoring, Purple Air
- **Distribution:** significant expansion of environmental monitoring through consumer products
  - Example: motion sensors in phones, Waze
- **Post processing:** integration of monitoring within projects/infrastructure for complex environmental metrics
  - Example: Scope 3 $CO_2$ tracking through supply chains

# Summary of Recommendations on Environmental Monitoring

## R01 – Facilitate and support the research, development and deployment of low cost air quality monitoring sensing systems

IoT sensing allows for the effortless collection of data from multiple devices and technical innovation in IoT has emerged in research communities worldwide, which provide new opportunities for low-cost, high resolution, environmental monitoring of new and existing chemicals of concerns. However, wider implementation will require the approval and encouragement of the federal government.

## R02 –Establish data repositories for privately collected data

The growth in IoT devices portends a rapid deployment of devices, and these devices have the potential to provide a strong public good, however without transparency privacy and data ownership issues may arise. Additionally, the use of different technologies and methodologies across different platforms may result in conflicting measurements, fostering misinterpretation and reducing public confidence in the monitoring process.

# RDD of low cost AQ monitoring sensing systems

Facilitate and support the research, development and deployment of low cost AQ monitoring sensing systems.

**Justification**

- Regulatory grade sensors are expensive and only a few can be deployed.
  - Their purpose is specific to looking at broad air quality of criteria pollutants for area and compare against EPA levels to protect health. This limits the scaling of AQ monitors
- Gap in local scalable air quality monitoring to support a variety of use cases, including
  - Increasing public awareness of AQ
  - Informing environment and public policy; real time testing of policy impacts
  - Environmental justice work
  - Supplementing regulatory grade sensing with IoT commercial sensors
  - Public health research
  - Construction site emissions monitoring
  - Rapid or emergency AQ monitoring
- Regulatory monitoring limited to few pollutants
  - Only six criteria pollutants
  - Emerging chemicals of concern (e.g., GHGs)

**Implementation**

- **Measurements:** facilitate research in low-cost sensing technologies for criterial pollutants, such optical particle scanning for particulate matter and M0x elements for gases, as well as detection of emerging chemicals of concern.
- **Correlation:** facilitate and support research and a program in correlating regulatory grade data with low cost AQ data
- **Expansion:** facilitate the expansion of wireless connectivity to support remote monitoring and sensing in areas not serviced by traditional connectivity (TV white space, satellite, etc.)

**Barriers**

- Regulatory monitoring spans multiple agencies, both at the federal and state/county level, often with different calibration protocols.
- Cost and resource constraints
- Legal barriers.

**Agencies**

- Department of Commerce (DOC)
- Federal Communications Commission (FCC)
- Environmental Protection Agency(EPA)
- Department of Energy (DOE)
- National Institute of Standards and Technology (NIST)

**Federal considerations**

- TBD

# Establish IoT environmental data repositories

Establish data repositories for privately collected data

**Justification**

- Provides transparency
- Promotes community research to conduct analysis on the data far beyond the capabilities of a single federal agency
- Helps address interoperability
- Enhance competitiveness

**Implementation**

- Consider DOE EIA sharing of data (e.g., power plants) as a possible implementation template
- Data sharing protocol should avoid differences in post processing
- Data sharing may need to be incentivized

**Barriers**

- Data quality and harmonization challenges
- Privacy concerns
- Company resistance to share data for proprietary reasons

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**Federal considerations**

- TBD