Monitoring by Citizens and Its Impact on the Air Quality Community and AIRNow

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What Is “Monitoring by Citizens”?

- Citizen science
- Measurements made by
  - Citizens
  - Non-government organizations
  - Fixed locations or moving platforms
- Examples
  - Bucket Brigade (toxics monitoring)
  - Citizen Weather Observer Pgm.
- Technology is key
  - Monitor cost and size
  - Internet telemetry and reporting
Purpose of Presentation

• Inform about recent trends in AQ monitoring
• Begin discussion about
  – Understanding citizen monitoring
  – Evaluating implications of citizen monitoring
  – Determining agency interests/concerns
  – Creating a community of
    • Public agencies
    • Citizens and NGOs
    • Private sector companies
  – Establishing a Citizen Environmental Monitoring Corps?
Impact of Citizen Monitoring on the Weather Community (1 of 2)
Impact of Citizen Monitoring on the Weather Community (2 of 2)

Source: NOAA MADIS
Example – Carbon Monoxide (Lake Havasu City) (1 of 3)

• Group
  – Lake Havasu City
  – Sonoma Technology, Inc.

• Measurement
  – CO (fixed land sites)
  – CO (mobile – boat)

• Instrument
  – AreaRAE CO monitor
Example – Carbon Monoxide
(Lake Havasu City) (2 of 3)

= Nearest CO monitor  = Study region
Example – Carbon Monoxide (Lake Havasu City) (3 of 3)
Example – EBAM (1 of 2)

- **Groups**
  - U.S. EPA
  - California Air Resources Board
  - U.S. Forest Service

- **Measurements**
  - PM$_{2.5}$ or PM$_{10}$
  - Temp., relativity humidity, winds

- **Instruments**
  - EBAM
  - Satellite/cell modem
Example – EBAM (2 of 2)

July 9, 2008
11 a.m. PST

Hourly PM$_{2.5}$ concentrations in µg/m$^3$

Source: AIRNow-Tech
Example – Black Carbon (1 of 2)

- **Group**: Magee Scientific
- **Measurement**: Black Carbon (BC)
  - BC is about 5% of total $\text{PM}_{2.5}$
  - Sources: combustion, especially diesel vehicles
- **Instrument**
  - Aethalometer$^\text{TM}$
  - Optical absorption method (filter strips)

Source: Tim Morphy, Magee Scientific
Example – Black Carbon (2 of 2)
Example – Carbon Monoxide (San Francisco) (1 of 2)

• Group: Intel Research
• Measurements
  – CO, O₃, NO₂
  – Temp. and relative humidity
  – Location and light
• Instrument
  – Cell phone size
  – Solid state sensors
• Testing on street sweepers in San Francisco

Source: Allison Woodruff, Intel Research
Example – Carbon Monoxide
(San Francisco) (2 of 2)

Source: Allison Woodruff, Intel Research
Example – CO$_2$ and VOCs (1 of 2)

- **Groups:** Aclima
  - U.C. Berkeley

- **Measurements**
  - CO$_2$ and VOCs
  - Temp. and relative humidity
  - Location, sound, and light

- **Instrument**
  - Real-time feedback (LEDs)
  - Solid state sensors
  - Internet
  - Community
Example – CO₂ and VOCs (2 of 2)

Source: Aclima and Greg Niemeyer at U.C. Berkeley

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Issues to Consider (1 of 2)

Data quality – function of application
- Directional response
- Response on short time scales
- Long term repeatability

Representativeness
- Spatial scales
- Temporal scales
- Mobile – sampling different environments
- Indoors vs. outdoors
Issues to Consider (2 of 2)

• Ownership
  – Distribution
  – Attribution

• Advocacy

• Increased coordination
  – EPA staff
  – State/local staff
Citizen Environmental Monitoring Corps

• Empower citizens to make air quality measurements
• Educate and certify
  – Air Quality 101
  – Monitoring principles
  – Quality assurance
• Integrate with AIRNow
• Reach out to state/local air quality agencies
Discussion

• What are your thoughts?
• What are your concerns?
• Do you know of citizen monitoring efforts?

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