Community Air Pollution Measurement, Educational Outreach, and the Village Green Project

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The Challenge

Local decision-makers and community leaders have expressed a need for technologies that would provide information to engage the community in a conversation about their local air quality. Continuous air pollution measurements in communities has been largely limited due to cost and logistical issues. In addition, current air monitoring practices generally use technologies that are only accessible to technical specialists.

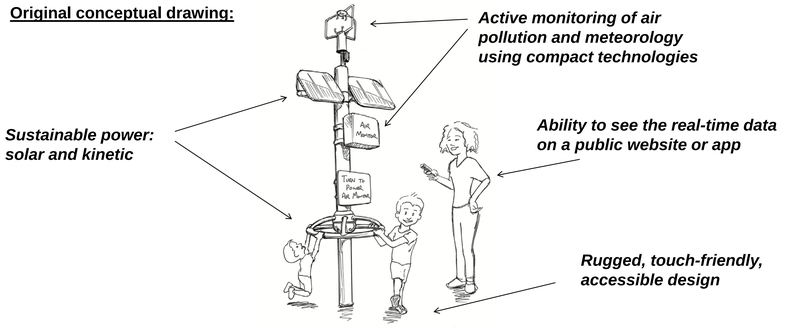
Design Process: Clarifying the Vision

A team of engineers, scientists, designers, communications specialists, and educational outreach experts came together to design a new air monitoring technology that would meet the following demands:

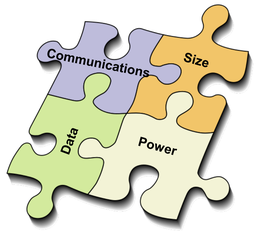
- **Low cost to install and run** – Goal of a sustainable, self-powered system (wind, solar, even human-power was considered!), minimal maintenance or laboratory work required.
- **Provides real-time data** – System would use active air and meteorological monitoring technologies and have automatic quality checks allowing readings to be made immediately available.
- **Engages the community** – The system needed to be designed to blend in seamlessly in a community environment, such as a park or playground.
- **Accessible data and information** – The data needed to be made publically available on a website that is engaging and informative.

The name "Village Green Project" sums up the vision, where the goal is to design an air measurement device that would fit well in a village green, which is a historical New England term for a field in the center of town that serves as a gathering point for a community.

Original conceptual drawing:



Design Process: Working out the puzzle



Detailed requirements for system components included:

- Monitoring equipment had proven performance for data collection in a field setting and sensitivity to ambient concentrations.
- Minimal power use and physically compact.
- Ability to stop and restart as needed to manage power.
- Air pollution measurement technology provided diagnostic data to support automatic quality checks on the performance of the instruments.
- Data output of the instruments does not require proprietary software to process, allowing open source platforms like the Arduino to manage the data streaming process.
- Wireless and real-time communications of the data.
- Rugged to withstand variable temperature and humidity.

Selected components:

Detection of $PM_{2.5}$

Thermo Scientific, pDR-1500 Aerosol Monitor

Detection of ozone

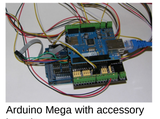
2B Technologies, Model OEM-106

Wind, temperature, humidity

Vaisala, HMP60

RM Young

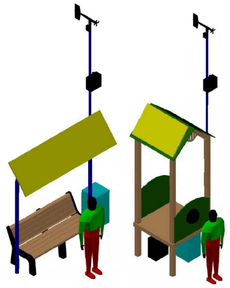
System controller



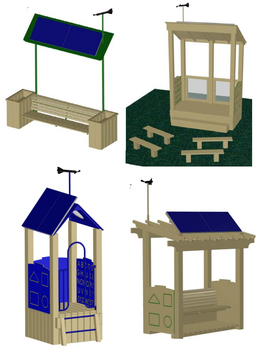
Arduino Mega with accessory boards

Physical structure:

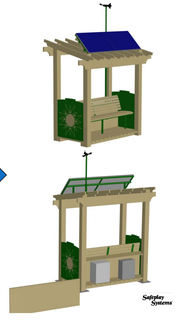
Design Phase 1



Design Phase 2



Final Design



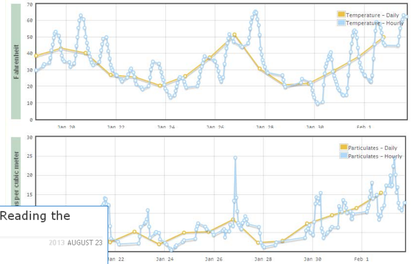
Installation at the Durham Library South Regional

Installed in June, 2013 with a ribbon-cutting ceremony that included the design team, library staff, local officials, and community members

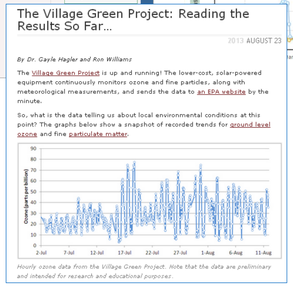
Communications and Outreach

website: villagegreen.epa.gov

Explore the data collected on the website: (note: the system kept running during a very cold and dark period in January!)



Blogs written during the design and prototype-testing process by the design team, hosted on EPA's It All Starts with Science



A gathering point for outreach events at the library

Acknowledgements

The Village Green Project would not have been possible without many helping hands, including Katie Lubinsky, EPA staff including Scott Moore, Renee Marshall, John Masters, Emily Snyder, Vasu Kilaru, Eben Thoma, Emily Smith, Rachel Clark, Robert Wright, Paul Groff, Richard Shores, Doug McKinney, Frank Princiotta, Tim Watkins, Dan Costa, Jewel Morris, Ann Vega, and Jacques Kapuscinski; Durham Library staff including Tammy Baggett, Sandra Lovely, Jennifer Brannen and Kathleen Hayes; ARCADIS staff including Drew Knott and Aaron DeBlois; CGI staff including Mike Tumbarello, David Crawford, Stephen Jackson, and Becky Taylor; Mike Strub with SafePlay Systems, and Jim Mosteller with Mosteller Design.