

An introduction to pollution monitoring with cell phones

It's amazing what you can do with ordinary cellphones. You don't need smartphones and you don't need much money.

This guide describes a new organizing tool for neighbors surrounded by pollution from coal-fired power plants, chemical plants, or other dangerous facilities.

If you live near a polluter, you may be able to smell, and sometimes taste, toxic chemical clouds coming from it. You may hear loud noises from the facilities at all hours of the night. You and your children may deal with breathing problems and skin problems due to pollution. You may see clouds of soot, many times in various colors, wafting over your neighborhoods. Yet, managers of the polluting facilities often deny that a problem exists.

Sound familiar?

Over the years, the Ohio Citizen Action Education Fund has found that a key catalyst in solving pollution problems is documenting the neighbors' experiences, making it more difficult for the company management to deny what they are doing.

We have experimented with different monitoring technologies, from swipe samples and water samples to air sampling buckets and real-time pollution monitors. We have found that there are many obstacles to their use. Because sampling is expensive and difficult to do, neighbors are reluctant to waste money or are hesitant to take the samples for fear they will do it the wrong way. Scientists who are experienced in working with the technology do not tend to live in the neighborhoods where the pollution is occurring, so they cannot be there to help on the weekends, holidays, or in the middle of the night, when the pollution tends to be the worst. Moreover, for many polluting plants, the data in the U.S. EPA Toxic Release Inventory or other databases already show how much of what chemicals the



company is emitting.

Rather than just confirming what we already knew, we have been looking for something more valuable: *what the pollution is doing to the neighbors as experienced and reported by the neighbors themselves.*

To be of any use, such a method would have to be (1) simple, so large numbers of people could use it without going through extensive training, and (2) available free or at low cost, because the worst pollution problems are in poor neighborhoods.

The answer may be in something already found everywhere in this country and around the world, in poor neighborhoods as well as wealthy ones: the cell phone.

It would have to be an approach that could work with the ordinary “feature” cell phones, not just with Smartphones because, again, the people most likely to be plagued by industrial pollution are least likely to be able to afford the high end phones. Smartphone use is growing fast, but it has only reached half of U.S. mobile telephone subscribers and only a quarter of the world mobile market, according to surveys by Nielsen and VisionMobile respectively. That means roughly the poorest half of all Americans do not now have cellphones, nor do the poorest three-quarters of the world.

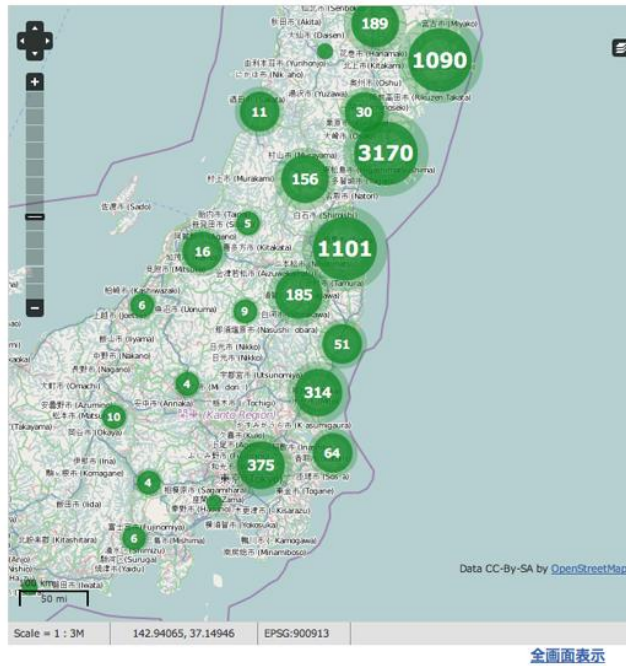
This guide describes what the Ohio Citizen Action Education Fund learned from a pilot test of using ordinary cell phone technology as a community-organizing tool. Based on our experience with the pilot, we have found that the cell-phone reporting system could become a useful hub of activity during a campaign, and that it could offer a variety of ways for volunteers to become involved.

The project was set up with the help of Nexleaf (<http://nexleaf.org/index.php>), a consulting group affiliated with UCLA. Nexleaf has worked with community organizations around the world to set up tracking and reporting projects with cell phones. Nexleaf helped us set up a website for the project, using an open-source web platform provided by a company called Ushahidi (<http://www.ushahidi.com/>).

Ushahidi describes its origins this way:

"Ushahidi", which means "testimony" in Swahili, was a website that was initially developed to map reports of violence in Kenya after the post-election fallout at the beginning of 2008. Since then, the name "Ushahidi" has come to represent the people behind the "Ushahidi Platform". Our roots are in the collaboration of Kenyan citizen journalists during a time of crisis. The original website was used to map incidents of violence and peace efforts throughout the country based on reports submitted via the web and mobile phones. This website had 45,000 users in Kenya, and was the catalyst for us realizing there was a need for a platform based on it, which could be used by others around the world.

The platform developed for mapping election activity soon found many other uses, such as the following map created within days of the terrible 2011 tsunami to track reports from all over Japan with labels such as "Wanted!" "Disaster Area" and "Available Service."



We asked various members of our staff and community residents to send messages to the site using a variety of reporting methods (texts from all different types of phones, emails, etc). Because this project was just a test, and we were interested in getting a significant volume of messages, we weren't asking the participants to report actual pollution incidents, as we would during a real campaign. Instead, we wanted to test reporting methods, ability to send photos and videos, messages sent at different times of the day and night, and so on. So we asked people to create messages (mostly fictional) and take photos and videos to send to the site during specific time windows.

This experiment helped us discover and fix a variety of reporting problems, especially involving the sending of photos from phones and the receiving of messages from certain types of smart phones. This test period enabled us to make improvements to the site and to make sure that we'd be able to accept the messages.

We found the Ushahidi platform to be user-friendly and flexible. The platform allows for the reporting to be arranged in different categories on the site (such as air pollution, smell, noise, or whatever categories the administrator sets up) and for pollution incidents to be mapped automatically once the addresses have been verified by the administrator.

The system showed that it could take digital information from many different sources:

- Simple texts from any type of simple feature phone, or smartphone such as an

iphone or Android phone.

- Emails from a home or office computer, laptop, or cell phone.
- Text messages with photo attachments
- Text messages with video attachments
- Emails with photo or video attachments
- Photo and video attachments to data entered on the website itself
- Twitter messages with and without videos or photos

The program includes a variety of methods to analyze and track the data received, which could be quite useful in a local campaign. It can provide a “punch card” graph that is a visual illustration of the number of incidents that are reported in given time periods, as well as charts showing the patterns of the types of pollution that are reported.

The program also has a section for “news feeds,” where users can see articles and other information that the administrator links to the site. The pollution reports themselves can be read and reviewed by anyone visiting the site.

We made significant progress in figuring out how to keep the three principal costs of the site down.

1. Instead of buying a server to host the program, we rented server space in the “cloud” for a specific period of time. The “cloud” refers to server capacity that can be rented and used without purchasing hardware. The cost of cloud rental is very low – we purchased it for \$59.95 for 60 gigabytes for one month from Linode (<http://www.linode.com/>), and better deals are available now, especially for longer rental periods.
2. Our existing service provider at the time (<http://www.Visn.net>) provided us with a subdomain to use as the web address.
3. The other cost that has to be covered is the cost of a text-message carrier (known as SMS) to receive the text messages; we paid \$30/month to Clickatell (www.clickatell.com). This provided for up to 10,000 incoming and 600 outgoing texts per month. Again, shop around. You can get better deals all the time. This level of spending would be affordable for most community organizations, which could raise it through local fundraising if necessary.

For the pilot project, a staff member handled the administration of the system. He learned that volunteers in community organizations could handle ongoing tasks in operating the system. For example, when the messages are sent to the system, an administrator needs to go through and verify them before they become visible on the website. This does not take long for each message, and could be done by anyone who is given an administrator role, and could be done through a home computer or other location. The other task for an administrator is make sure that the address of the pollution incident (as opposed to the address of the person reporting the pollution) is correctly entered into the system so that it is automatically placed on the map.

We have learned in our good neighbor campaigns that can be helpful to specify a certain time for a reporting project like this, to keep up people's interest and enthusiasm. For example, we could say, "for the month of June, we need everyone in the neighborhood and people who come through the neighborhood to text in messages and photos of the pollution they see coming from the coal plant." Neighborhood team captains could be in charge of making sure everybody has the phone numbers and email information they need to report in, and people could all be watching the information as it accumulates on the website.

A one-month project can be successful because people already have the sensors -- their eyes, ears, and noses -- and the reporting devices are already in everyone's hands or pockets: their cell phones.

Observations of particular pollution episodes could then also be researched and corroborated with reports from the facilities, like malfunctions, and can be used by the neighbors when they meet with company managers to document what they are experiencing.

Media

The results of your mapping can also be used directly with local news. In newspapers, on television news, and on local blogs, the information and images are genuinely newsworthy, being local, participatory, visual and unusual.

New developments

Since the pilot test Ushahidi has been busy developing a new platform called CrowdMap which greatly reduces the administrative role of the community group. To investigate the latest offerings, visit <https://crowdmap.com/>. The site includes an index of various uses people have found for it.

The Ohio Citizen Action Education Fund wrote this guidewith the generous assistance of the Winslow Foundation. Ohio Citizen Action is Ohio's largest environmental organization, with 80,000 members. Non-profit and non-partisan, Ohio Citizen Action was founded in 1975. For more information, please contact Sandy Buchanan, Executive Director, Ohio Citizen Action, 614 West Superior Avenue, Suite 1200, Cleveland, Ohio 44113, (216) 861-5200, sbuchanan@ohiocitizen.org.