Providing the nudge

The best way to help communities clean up toxic sites is to advise and encourage, say Andrew McCartor, Bret Ericson and Sandra Gualtero

Environmental pollution is the single largest cause of disease and death in developing countries, causing 8.9m deaths annually worldwide. By comparison, HIV/AIDS causes 1.5m deaths and malaria and tuberculosis fewer than 1m each. More than one death in seven is the consequence of environmental pollution. Despite the tremendous impacts on human health and the global economy, the effects of pollution continue to be undercounted, underreported and insufficiently addressed in national policies and international development agendas.

Pollution is strongly linked to poverty. The overwhelming majority of the disease burden from pollution - 94% - falls on residents of low- and middle-income countries. It disproportionally affects countries that are ill equipped to deal with the problem, and vulnerable populations that do not have the resources to protect themselves and recover. The disproportionate poisoning of the poor represents a global environmental injustice.

Pure Earth (formerly the Blacksmith Institute) has conducted more than 80 projects to help communities mitigate toxic exposures while also protecting livelihoods. This has proved manageable, cost-effective, and eminently do-able – by the communities themselves, following a nudge in the right direction. Let’s look at a few cases.

PCB Beach: Sumgayit, Azerbaijan
Andrew McCartor

It’s the first day of my first solo work trip. I’m in Azerbaijan to identify and clean up toxic hotspots. I have been here for less than 24 hours. My boss is calling from New York to check in, and I’m in jail.

“Drew, mate, how’s it going out there? Seen anything interesting?” Indeed. I have seen children playing on a beach composed of dried effluent from a chemical plant that is highly contaminated with polychlorinated biphenyls (PCBs), benzene, and benzo[a]pyrene. I have seen men bagging this toxic ‘sand’ and selling it as construction material at the local market. And now, sitting next to me in our cell, I see a very nervous local colleague having a rough first day as our new national coordinator. I don’t say any of this to my boss. “It’s going…you know…peaks and valleys.”

I work for a non-profit organisation that cleans up life-threatening toxic pollution in low- and middle-income countries. I am in Azerbaijan to design and implement a cleanup project at the aforementioned site, which I have come to call “PCB Beach”.

Back in Azeri jail, my colleague and cellmate has a plan. He tells the police that he is a professor (true) of international law (false), and that under the Geneva Convention the police are required to call the American Consulate to explain my arrest. To this day, I don’t know if that is true, but it doesn’t matter, because the police don’t know either. A minute later we are outside the station.

We spent the next year meeting with Azeri government officials, the owners of the project site, and other relevant actors. What emerged was a peculiar, but not uncommon picture. The local actors could contribute expertise, money, labour, heavy equipment, even free disposal of contaminated soil in a hazardous waste landfill. They had everything required to complete a cleanup project. So what were they waiting for? Sometimes people just need a nudge.

Between 2014 and 2015, we helped local partners in Azerbaijan move 600 m3 of toxic material to a high-quality hazardous waste landfill, re-grade the land with an equal amount of clean soil/sand, and plant the site with native vegetation. We contributed technical assistance, a small portion of the project funding, and most critically, the nudge to act.

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The project paid for the cleanup of the 38 most contaminated residential yards. As of July 2015, an additional 67 yards had been remediated by local homeowners using the project’s protocol, but without external support or funding.

**toxic ‘craft villages’: Dong Mai, Vietnam**

Bret Ericson

During the Vietnam War, a US bomber crashed near a rural North Vietnamese village. By chance, someone in the village had experience in smelting metals, and saw the plane’s mangled aluminium parts as an opportunity. He dismantled it, carried the pieces home, and melted them down to create aluminium ingots for resale. One by one, his neighbours caught on and the village was transformed into a small-scale aluminium smelter. Years later, aluminium scrap collected in nearby Hanoi would arrive by the truckload, and return to Hanoi as ingots.

By the time I arrived in Vietnam, China’s demand for raw commodities had helped transform hundreds of Vietnamese villages into horizontally-integrated metal recycling factories, each specialising in a particular metal or product. These villages are now misleadingly referred to as ‘craft villages’.

Our interests in these villages are the potential human health risks, particularly risks to children. Backyard smelting presents such a variety of potential hazards that it can be difficult to identify, untangle and mitigate each one. Personal protective equipment is totally absent, as are emissions controls. Children play next to furnaces firing at 1,000°C. In this context, is it feasible to pull the entire village from the Victorian era into the modern industrial age? No.

Since 2008, we have worked with the Vietnamese government to assess nearly 100 metal recycling villages. Our team of local investigators takes photographs and environmental samples, conducts interviews, and uploads their investigations into a global database. We work with government colleagues to compare and prioritise the sites based on health risks. When resources are available, we implement a cleanup project at a priority site.

It was in this context that in 2013 we came to Dong Mai, a village 30 km from Hanoi, and the site of the most severe lead poisoning epidemic I have ever witnessed. Dong Mai, like the other villages, had processed metal for decades. Though in this case, the metal was lead, an acute neurotoxin. The lead comes from used automobile batteries, also known as used lead-acid batteries. The batteries are broken open by hand, the acid poured out on the ground, and the lead removed and smelted in open furnaces.

In 2006, the Vietnamese government acknowledged the risks in Dong Mai and invested hundreds of thousands of dollars to construct an industrial area 1 km from town. The majority of the smelters were relocated, reducing active emissions of lead in the village for the first time in decades. This act alone represented an important and astute step by Vietnamese government to improve public health.

Pure Earth conducted extensive soil sampling to assess contamination levels. We helped local partners in Azerbaijan move 600 m³ of toxic material to a high-quality hazardous waste landfill, re-grade the land with an equal amount of clean soil/sand, and plant the site with native vegetation.
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In June of 2015, I received a late-night email labelled “URGENT.” It was from a nurse in the Mexican state of Morelos who was conducting screenings of lead levels in the blood of newborns as part of a pilot project. The nurse had just discovered a baby with a blood-lead concentration seven times above the level of concern or reference level set by the US Centers for Disease Control and Prevention. We sent our country coordinator along with medical staff to the family’s home, where, predictably, they saw a kitchen full of beautiful Mexican glazed cookware.

When the average person pictures chemical pollution, they might conjure billowing smoke stacks or toxic green slime that turns turtles into mutant ninjas. Few would picture a woman sitting behind a pottery wheel making ceramics. In Mexico, however, that image is quite relevant to the country’s pollution story. Today, tens of millions of Mexicans suffer from low-level lead poisoning from glazes used in traditional ceramic cooking pots. When the deep-lustered glaze touches acidic food (such as Mexican food), the lead in the glaze leaches into the meal, and ultimately into the blood of the person enjoying it. The baby (and mother) in Morelos had been poisoned by leaded pottery.

In July the journal Annals of Global Health published a study by Pure Earth, the Mexican Institute of Public Health and others regarding concentrations of lead in the blood of Mexican children. The study was a meta-analysis of all available data on blood-lead levels in Mexican populations dating back to the 1970s. It showed not only that millions of Mexicans experience lead poisoning, but that 15% of the Mexican population has likely experienced a decrement of five IQ points as a direct result. In other words, millions of Mexican children are not reaching their full intellectual potential because they are being slowly poisoned by their cookware.

Although leaded glazes have been officially banned in Mexico since 1993, lax enforcement allows potters to continue using the toxic glazes. Each day, countless Mexican children receive a dose of this potent neurotoxin, and if you have eaten in a home, restaurant or hotel in Mexico, you might have received your dose too.

We’ve been working with Mexican authorities and pottery producers to replace leaded glazes and clean up contaminated workshops since 2008. Lead-free glazes are now available that look and function just like the leaded ones and cost less. Given that a solution to this problem is available, simple and cheap, we anticipated that the adoption of lead-free glaze would be quick and easy. We were wrong. Changing a centuries-old practice, even if the change seems logical and urgent, is hard.

We encountered several hurdles regarding perceptions among potters. Some said their customers preferred leaded glazes, and simply would not buy alternatives. Many argued that their family
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Health and wellbeing

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The overwhelming health burden from toxic pollution is born by residents of low- and middle-income countries. Secondly, many pollution problems that jeopardise public health have relatively simple, inexpensive solutions. Finally, with a little technical advice, modest funding and a nudge, local communities can greatly improve their environment and health.

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If companies are argued to be ‘inefficient’, £99 amount to be done. The temperature for MSW typically ranges from 593–982°C. Regardless of feedstock, converting 70–85% of the carbon in the feedstock to syngas. Currently, large-scale gasifiers are capable of processing up to 3,000 t/d of hydrogen and carbon monoxide – the basic building blocks for fertilisers, and transportation fuels. The clean syngas can be sent to a boiler, internal combustion engine or product generator, where it can be converted into electricity, chemicals, fertilisers, substitute natural gas, and transportation fuels. The process requires less energy and produces less waste than traditional methods. Gasification could be the answer.

For example, where previously one might require more energy to extract and process. Put simply, gasification converts any carbon-based material – such as coal, petroleum coke, refinery wastes, biomass, municipal solid waste (MSW), wastewater treatment biosolids, and blends of these – to a ‘value’ from coal, petroleum coke, refinery wastes, biomass, municipal solid waste (MSW), wastewater treatment biosolids, and blends of these. What's left is a clean synthesis gas (or syngas) that can be converted into electricity, chemicals, fertilisers, substitute natural gas, and transportation fuels.

Figure 1: The gasification process
Figure 2: Gasification products

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