Dr. Sherrie Steiner, Community Members, and Students Conduct Research on Air Quality in Hartford City, Indiana

Since 2006, Hartford Iron and Metal (HI&M) in Hartford City, Indiana, has disregarded regulations for proper handling of harmful chemicals, including PCBs, from their steel recycling activities. Since 2009 the Indiana Department of Environmental Management (IDEM) has mandated Hartford Iron and Metal to clean the site of the chemicals three times, the first in a Court Approved Consent Decree. Though some standards of site cleanup were met, there is some evidence that the company's improper handling of harmful chemicals persists. Nonetheless, IDEM has allowed Hartford Iron and Metal to continue to do business and expand operations eleven year following the initial citation for violations and despite still being uncompliant with the Court Order Decree of 2009.

A sign at the Hartford Iron & Metal plant warning of PCBs, or polychlorinated biphenyls.

The failure of HI&M to comply with the decree continues to pose major health risks for the local residents. Blackford County has some of the highest age-adjusted cancer rates in the state. In the past, Blackford County Concerned Citizens tested water and soil samples to help identify environmental factors that might be influencing health conditions. Contaminants were found to be higher than Indiana state background levels but were not high enough to be considered "actionable." Air standards are more sensitive but methods for testing air pollutants are prohibitively expensive.

This last spring, Dr. Sherrie Steiner and students from her Environment and Society course worked with high school students from North Manchester High School, the Blackford County Concerned Citizens (BCCC) and members from the community to collect moss for testing after learning of the method of testing for pollutants from a similar study conducted in Oregon. Moss was collected from trees above splash levels at residential locations around HI&M and from a park further away from the facility to provide a control sample. Locations were chosen downwind and upwind of HI&M to determine whether contamination, if there was any, was being carried by the wind or generated by the operations of HI&M.


A student collecting moss samples.

The results are in and they provide an important **preliminary** assessment of atmospheric pollution. Samples were tested for cadmium, chromium, nickel, arsenic and lead. The lab work confirmed the suspicions. The moss collected from residential locations near HI&M contain concentrations of heavy metals that were significantly higher than the levels found in the moss collected at the park. Statistical analysis of the findings confirmed that the higher levels near HI&M is meaningfully different from that found in the park (one-tailed, t-test, $p<.01$). Cadmium, chromium, arsenic, and lead are all known carcinogens.

The moss sample data for each element serve only as an index, meaning that high concentrations in moss are suggestive (but not conclusive) of high concentrations in the atmosphere. IDEM does not have measurable air standards for heavy metal concentrations in moss. But the notification of the findings by BCCC President have already spurred IDEM to engage their Office of Air Quality. IDEM is taking this seriously because past research suggests that moss concentrations reflect atmospheric concentrations for many elements even though the strength of these relationships remain unknown and varies by element (Aboal et al. 2010). For example, high levels of cadmium in moss were associated with two stained-glass manufacturers in Portland, Oregon. This stimulated an exhaustive investigation that explored other possible sources of cadmium in the air, additional moss sampling, and the placement ofexpensive air quality monitoring instruments on site. The exhaustive investigation confirmed the initial moss findings (Donovan et al, 2016).

Dr. Steiner's current students from Social Theory are picking up where things left off. The collection process, the results, and the implications of the results are being presented to the community by the students. The Environmental Resources Center has contributed by providing a map showing where the samples were taken.

On October 21, nineteen IPFW students will present the findings to neighborhood residents at Hartford City Hall. The goal of this first meeting is to get as many community members engaged as possible to garner a larger presence of supporters for the second meeting.

On November 18, the students will present the findings to Hartford City Officials at City Hall. AP Science high school students from North Manchester High School will also attend these meetings. The presence of a large number of individuals in support of enforcing the Court Order Decree may be just what is necessary for City Officials to take the needed action. The students will thoroughly explain the methodology of the collection process, the types of moss used for obtaining the measurements, the results and what they mean for the residents of Hartford City.

Additionally, Steiner and her students will work with the community to assist in proposing viable solutions to the issue. One such solution would be the relocation of HI&M to an industrial park outside of the city. This would allow the company to continue their operations, yet minimize the health risks to the locals.

The time for change is upon us. With all the facts presented to the community and its' officials, it will be difficult for IDEM to continue to turn a blind eye to the impact of fugitive dust on neighborhood residents.

Credit for the article goes to Darci Collison, Sierra Marsh, Rachel Mitchell and Anissa Bredemeyer.