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RESEARCH ON METALS AND THEIR ORGANIC COMPOUNDS

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ABSTRACT

Extreme amounts of metals and organic compounds are being consumed in the manufacture, use, and disposal processes of modern materials, products, and items, and may be discharged into the environment. Metals in general and specific organic chemicals may be harmful in the short or long term, therefore this might pose environmental dangers depending on the conditions. Where, then, have these inorganic and metallic materials been put to use? In what kinds of settings or products? Substance flow analysis (SFA) is a technique that may be used to handle such complications. The study provides precise measurements of flows and stocks within well-defined limits. This thesis identifies four primary topics for future study. To get insight into the flows and stocks associated with consumer goods consumption, apply SFA to hitherto unstudied substances. ii) Creating SFA to accommodate research on substance cycle patterns and quantifying research into possible Evaluation of the factors contributing to the shift, such as chemical laws, environmental goals, and other similar initiatives. How well do these shifts correlate with actual material movement? When it comes to making choices about the environment, iv) how can SFA be useful? The indicated goals look at the presence of antimony (Sb), cadmium (Cd), lead (Pb), and mercury (Hg), as well as the class of organic compounds known as alkylphenol/alkylphenol ethoxylates (AP/APEO), in urban settings, with Stockholm, the Swedish capital, serving as an example.

Keywords: *organic compounds, consumption of metals, metals*

INTRODUCTION

Extreme amounts of metals and organic compounds are being consumed in the manufacture, use, and disposal processes of modern materials, products, and items, and may be discharged into the environment. Metals in general and specific xenobiotic organic chemicals may be hazardous in the short or long term, therefore this might pose environmental dangers depending on the conditions. The graphs illustrating the global output of various metals attest to the dramatic rise in demand for these commodities across the world. For instance, more metal is going into use than is leaving the system in the global anthropogenic cycles for copper (Cu), zinc (Zn), and nickel (Ni).

For instance, each year the globe produces 15 million tons of copper. That's around a thousand times higher than the global output of cadmium (Cd) and one hundred times more than the global output of antimony (Sb). Chemicals are used extensively in modern society. Approximately 300 million tonnes of chemicals are produced annually in the European Union (EU, detailed for 15 nations) depicts annual global plastic output, which is around 250 million Several organic compounds' rapid buildup and emission hazards have also Where, then, have these inorganic and metallic materials been put to use? Which features/conditions? Is it feasible to monitor drugs from the time they are made until they are discarded? Substance flow analysis (SFA) is a technique that has been created and implemented to address such inquiries. The study provides precise measurements of flows and stocks within well-defined limits. Due to the challenges in retrieving specific data, the quantity of flows and stocks is generally expressed in magnitudes.

Emissions from items are considered diffuse (or dissipative), making them more significant in Sweden than emissions from point sources. For chromium (Cr), this was first established. Pollution from diffuse sources will follow the patterns and mobility of commodities, whereas point source pollution will persist in places with high production and/or insufficient cleaning methods. The Environmental Protection and the Swedish Environmental Code of (see the ordinances of SFS) are two pieces of legislation that outline techniques for environmental pollution control in Sweden. Even though the European development of the Integrated Environmental Product as described has gone through several steps since the end-of-pipe restrictions were introduced in the 1960s and 1970s, there are still gaps in the overall regulation and management for the control of diffuse emissions in the environment.

Furthermore, "the concept of cleaner production (prevention of waste and emission)" in the 1980s and "the concept of products policy" in the 1990s were the driving forces behind the developments. Since the introduction of directives like those for Batteries, ELV (end-of-life vehicle), RoHS (restriction of the use of certain hazardous substances in electrical and electronic equipment), and WEEE (waste from electrical and electronic equipment), European chemical regulations do now cover very specific products; however, as the article concludes, this is a complex task for environmental management to embrace in its entirety due to the large number of chemicals present in so many manufactured and consumed products.

Certain items, such as lead ammunition, have been subject to new regulations in the Swedish market. In order to phase out metals and xenobiotic organic compounds used in products other than automobiles and electrical and electronic equipment, regulations have been implemented at the substance level (see the ordinances of offer a broader introduction to the IPP as related to the Swedish environmental policy, which together with the products directive includes, for example, producer responsibility, environme Dense human habitation, as evidenced by a society's material buildup (the technosphere) (Brunner and A recent analysis of urban metabolism found that, with a few exceptions, wastewater, energy, and waste metabolism per capita are all on the rise. Furthermore, there is little doubt that an increase in hazardous waste poses a threat to future sustainability.

OBJECT

1. to associate categories of items with flows that are significant to the environment.
2. potential markers for the cessation of Cd, Hg, and Pb use.
3. Third, to evaluate the SFAs as models for keeping tabs on societal currents

RESEARCH METHODOLOGY

Triplicate samples were taken in both the winter and summer of 2017. Two locations were sampled along the canal, and four were sampled in the area immediately around the dump, as shown in. The soil samples were taken from the top 10 centimeters of soil and placed in sealed plastic bags for further analysis. Heavy metals, phthalates, bisphenol A, and PAHs were measured in soil samples after they were air-dried at room temperature.

HEAVY METALS ANALYSIS

Soil samples were analyzed with an atomic absorption spectrophotometer (Bioteckno, Model: GF95Z, UK) to determine the levels of heavy metals such lead, cadmium, arsenic, and mercury (Pb, Cd, As, and Hg). In Lebanon, at the Lebanese Agricultural Research Institute (LARI), the data was analyzed. The analytical process is described in depth in the Additional Materials.

ORGANIC COMPOUNDS EXTRACTION AND ANALYSIS

Extraction and fractionation procedures for phthalates and bisphenol A were performed as reported by Fromme et al. Pule et al.'s procedures were used to extract and fractionate polycyclic aromatic hydrocarbons. The details may be found in the Additional Files.

DATA ANALYSIS

Soil quality criteria used to evaluate the levels of contamination are described in, and the amounts of heavy metals analyzed in soil samples taken over the summer are presented in. Figure 1 shows a graphical representation of the range of heavy metal concentrations in the soils of the study locations.

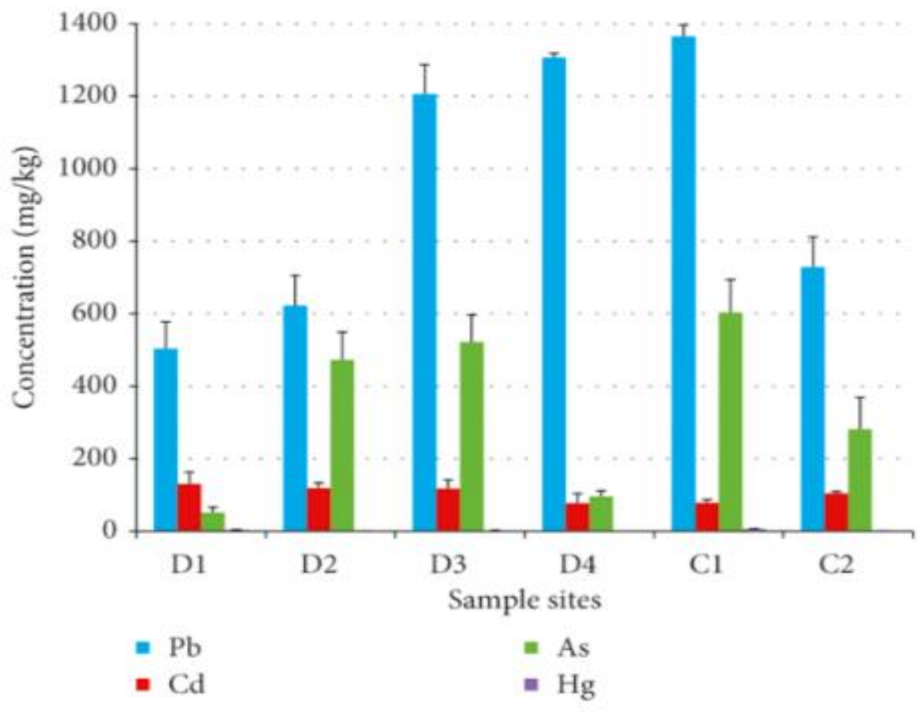

Figure 1 Distribution Of Heavy Metals Among Different Sampling Sites

Concentrations of Pb, Cd, As, and Hg varied from 504.3-1365 mg/kg, 77-131.1 mg/kg, 51-603.3 mg/kg, and 0.16-6.48 mg/kg, respectively, in all of the samples obtained from the dump and canal. Soil samples taken from the C1 location had the greatest quantities of Pb, As, and Hg. The greatest amounts of Pb were found in samples taken from the D4 site (1,307.07 mg/kg), whereas the highest levels of Cd and Hg were found in samples taken from the D1 site (131.1 mg/kg and 3.58 mg/kg, respectively). Both D2 (471.97 mg/kg) and D3 (521.7 mg/kg) locations had exceptionally high levels of As in their soil samples.

Pb levels at D3, D4, and C1 locations exceeded the quality criteria of EEC, France, US EPA, and CCME, as determined by comparing the amounts of heavy metals to the sewage sludge MPLs published by many nations. Furthermore, the Cd levels at all locations except D4 and C1 were higher than the EEC, French, US EPA, and CCME MPLs for Cd in sewage sludge. Cd levels at the D4 and C1 locations were lower than the MPLs established by the US EPA, but higher than the Cd MPLS established by the EU, Canada, and France. All locations except D1 had significantly elevated amounts of As, much over the limits set by the US EPA and the CCME for sewage sludge. All locations had As concentrations higher than the maximum permitted limit (MPL) of 25-30 mg/kg, which is set by just three EU countries (Bulgaria, the Czech Republic, and Denmark). All Hg levels were much below the MPL threshold recommended for sewage sludge.

Each metal's average MPL was determined (supplementary material) and then the 'fold over the average maximum permitted level' was determined (supplementary material) for each metal at each location. The results of this study shed light on the relative toxicity of the metals investigated at each location. The results showed that at most locations, As levels were much higher than the average MPL, followed by Cd and Pb. The results found in samples taken from site C1 are particularly worrisome, as seen below: Over the average, the levels of As, Cd, and Pb were all much higher than what is considered safe.

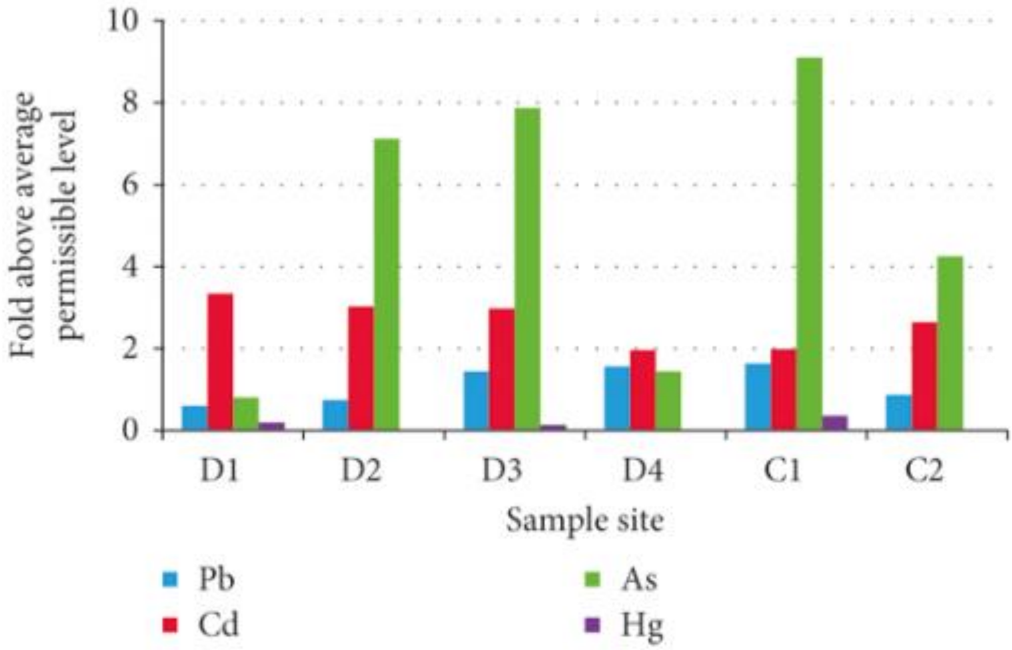

Figure 2 Relative Toxic Effects Of Heavy Metals At Different Sampling Sites, Expressed As Fold Above Average Permissible Level In Sewage Sludge.

In addition to the sludge dirt, samples were also taken from the nearby agricultural regions. Heavy metals were evaluated in these samples, and their concentrations were compared to the maximum allowable limits for agricultural soil as specified in the recommendations. in All of the soil samples tested indicated lead, cadmium, and arsenic concentrations that were over the limits set by the Food and Agriculture Organization of the United Nations, the World Health Organization, the European Union, the United States, France, Germany, Austria, India, and the Arab-German Cooperation project from 1997 to 2003. Only at the D1 and D3 sites did the measured Hg concentrations exceed the MPLs. Site C1 is not used for planting because of its proximity to the waste leachate and the relatively high quantities of heavy metals found there.

The fold above the agricultural MPL for each metal at each site was also computed and shown to further illustrate which metals may represent the most risk to inhabitants who may consume food grown in the agricultural land around the examined waste location. When compared to the typical MPL, Cd levels were well above the norm, followed by As and Pb. Site D1 had the largest fold over MPL for Cd (62 -fold), while site C1 had the highest fold above MPL for As (18.4-fold), Pb (8.2-fold), and Hg (3.8-fold).

Household and hazardous solid wastes have been dumped illegally due to a lack of waste management rules in Lebanon. One of the towns impacted by a landfill including clinical, industrial, and municipal garbage is Deir Kanoun Ras El Ain. The dump's leachates drain into a canal that goes all the way around the landfill. Heavy metals and organic chemicals found in these wastes and their leachates are well-documented as being harmful to human health and the environment.

Our analysis of soil samples taken from the Deir Kanoun landfill and canal revealed that Pb, Cd, and As were the most prevalent heavy metal contaminants. We found that substantial quantities of Pb and Hg (81.3-2374.1 mg/kg and 0.2-3.2 mg/kg, respectively) were found in soil samples taken from a dumpsite in India, which is consistent with prior published research results. Soil samples from a Croatian dumpsite had Pb and Hg concentrations of 605-968 mg/kg and 0.73-1.51 mg/kg, respectively, which is consistent with our findings. Pb levels in our study are greater than those collected from dumps in Nigeria (63.58-418.58 mg/kg) and Sweden (254-895 mg/kg), although Cd values obtained by us are higher than those in India (0.6-12.5 mg/kg).

Not only that, but the maximum permitted levels (MPL) for Pb, Cd, and As in sewage sludge were also exceeded. As had the largest fold over average MPL, followed by Cd and Pb, when looking at metal concentrations at each location. When we compared our findings to the maximum permitted levels of heavy metals in agricultural soil established by various guidelines, we found that all of the soil samples had Pb, Cd, and As amounts that much above the quality requirements set by a number of organizations. It is important to note that the canal from which the samples were taken irrigates agricultural regions surrounding the Deir Kanoun Ras El Ain waste area.

Residents who live near the dumpsite and eat food grown in polluted agricultural areas may be at danger from Cd and As since these metals considerably exceed the MPLs for sewage sludge and agricultural soil. In fact, it has been established that exposure to excessive amounts of Pb, Cd, and As can cause significant diseases in living beings. Children are especially vulnerable to the neurotoxic effects of lead since even low amounts can produce vomiting, weakness, diarrhea, seizures, and eventually coma. Residents in Cd-contaminated areas may suffer from lung, bone, and kidney problems. Even at low concentrations, As is harmful to humans because it may affect vital organs including the brain, liver, kidney, stomach, and intestines.

Further, the presented results here are worrisome because Cd is extensively linked to low bone mineral density, which in turn increases the risk of bone fracture in both experimental models and population-based studies. As a result of this, we surveyed the rate of bone fractures in three villages near the landfill that are home to Lebanese and Syrian refugees. Bone fractures were experienced by 27.4% of research participants, according to data acquired from locals in the area under investigation that has not been published. These results are in line with those of other research showing a link between low-level Cd exposure and an increased incidence of bone fractures in males over the age of 65.

CONCLUSION

Soil samples taken from the Deir Kanoun Ras El Ein waste and canal were found to be highly polluted with metals, according to the present study. Organic substances such as phthalates, bisphenol A, and polycyclic aromatic hydrocarbons (PAHs) were also detected. Heavy metal concentrations were thousands of times higher than the safe levels set by various organizations. The health of locals who eat food produced in polluted soils may be threatened by the presence of heavy metals and organic compounds in the irrigation canal's water supply. There is obviously a need for greater research to identify the degree of heavy metal pollution near and far from the dump's site, as well as in the crops grown in those areas. Since the presence of heavy metals and organic pollutants is attributable to the unregulated disposal of solid waste at this site, the Lebanese government should institute more stringent environmental policies regarding waste management and provide residents with advice on how to best handle data related to their health.

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