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Health hazards resulting from the WEEE combustion at illegal e-waste yards in developing countries on the example of Agbogbloshie

Zagrożenia zdrowia wynikające ze spalania e-śmieci na nielegalnych elektronicznych wysypiskach śmieci w krajach rozwijających się na przykładzie Agbogbloshie

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Słowa klucz: e-wysypiska, ochrona środowiska, metale ciężkie, Ghana
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Streszczenie

Kraje rozwijające się nie posiadają przepisów prawnych i odpowiedniej infrastruktury do bezpiecznego przechowywania i utylizowania elektronicznych śmieci. Z tego powodu w tych miejscach składowanie odpadów zwykle wiąże się z zasypywaniem lub paleniem. Szczególnym problemem w Afryce Zachodniej jest spalanie martwego sprzętu elektronicznego w składowisku odpadów elektronicznych zlokalizowanym w Agbogbloshie na przedmieściach stolicy Ghany. W wyniku procesu spalania substancje chemiczne niebezpieczne dla zdrowia ludzi są uwalniane do atmosfery, głównie metale ciężkie, kwaśne gazy, wielopierścieniowe węglowodory aromatyczne (WWA) i dioksyny. W artykule poruszono problem zagrożeń zdrowia w wyniku spalania WEEE na nielegalnym e-wysypisku w Agbogbloshie w Ghanie.

Summary

Developing countries do not have legal regulations and adequate infrastructure to safely store and dispose of rubbish therefore in those places waste disposal usually involves burrying or burning. A particular problem in West Africa is the burning of waste electrical and electronic equipment (WEEE) in the e-waste dumping located in Agbogbloshie in the suburbs of the capital of Ghana. As a result of the combustion process, chemical substances hazardous to human health are released into the atmosphere, mosty heavy metals, acid gases, polycyclic aromatic hydrocarbons (PAHs) and dioxins. The paper addresses the problem of health hazards due to the combustion of WEEE in the illegal e-dumping site in Agbogbloshie, Ghana.

Introduction

Waste electrical and electronic equipment (WEEE or e-waste) disposal and storage is a big problem around the world. Developing countries do not have legal regulations and adequate infrastructure to safely store and dispose of rubbish therefore in those places waste disposal usually involves burrying or burning. Burining of e-waste poses harmful threats, it causes soil pollution leading to contaminated water and food. Air contaminants produced during the combustion process are affecting the health of the workers and inhabitants including children leaving at these sites [1].

One of the biggest e-waste yards is located in Agbogbloshie in suburbs of Ghana's capital. The Agbogbloshie is about 31.3 hectares area located less than a kilometer from Central Business District of Accra, a place where almost 80,000 are working and leaving [7].

Fot. 1 WEEE combustion at e-waste yard in Agbogbloshie (author's photo)

The Basel convention, supported by European and international directives, forbids developed countries from dumping hazardous waste in developing countries. In Ghana there is no enforcement of the law and used electronic equipment from developed countries still arrives to the country in the form

of donations. Ghana is one of the most developed countries of West Africa. According to Pew Research Center data in 2015 about 83% of the Ghana population owned mobile phones, of which 21% had new generation smartphones that allow connection to the Internet [4]. Only few percent of donated equipment are new. Most of the electronic devices are used, old generation electronic devices. Old equipment due to lack of purchasers ends at the strap yards. Ghana is not good place for outlet of second hand obsolete old generation electronic equipment.

One of the biggest places in the world where WEEE are stored is Agbogbloshie. Most of the e-waste from the area arrives to this place. The demand for electronic waste at Agbogbloshie began to grow when the owners of scrap yards discovered that they could recover valuable substances such as copper, iron, nickel and gold while burning WEEE. Since this time they started to deal with garbate collectors and reward them for separating electronic equipment containing big amounts of metals and sending it to the Agbogbloshie scrap yard. Agbogbloshie became an e-waste market.

Based on the authors' own observations at the Agbogbloshie e-waste, the main electronic wastes being processed are obsolete computers, monitors, televisions and phones, in smaller quantities some household electric appliances. These devices are manually dismantled at small workshops running inside the market. Some components, especially plastic covered wires and cables, are taken to sites on the back of the yard where they are burnt in order to separate metals from plastic covers [6]. This process makes it possible to recover metals in order to sell them. WEEE combustion is the main source of income for e-waste employees and their families. The main activities of e-waste employees are looking for, sorting, dismantling and the most harmful for the health- burning e-waste materials [9]. Protection methods from the toxic smoke are not used among e-waste workers who are most exposed to toxic fumes.

Health implications of e-waste burning process

Burning of e-waste can result in exposure to fumes containing toxins: heavy metals, acid gases, polycyclic aromatic hydrocarbons (PAHs) and dioxins. Working and leaving at e-waste sites causes exposure to hazardous emissions that can have damaging health effects [11].

Calvanos’s research shows that air samples collected at Agbogbloshie indicates elevated levels for aluminum, copper, iron, lead and zinc. From the 100 soil samples taken, more than half were contaminated and above the US Environmental Protection Agency standard for lead in soil [1]. Also Itai’s research indicates high levels of copper, zinc, lead and aluminium in soil and ash Samales detected [2]. It means that fruits and vegetables grown at this place also are contaminated with heavy metals what pose a threat for people consuming food from this place.

Srigboh's research results indicates that blood cadmium and lead and urinary arsenic levels of Agbogbloshie empleyees and inhabitants were significantly elevated above the United States reference levels [9]. Asante's research proves that concentrations of iron, antimony and lead in urine of e-waste workers were significantly higher than those of the reference group and arsenic concentration in urine was relatively high [3]. Calvanos proved that barium, cobalt, chromium, copper, iron, selenium and zinc levels significantly elevated in the blond serum among those exposed to toxic fumes at e-waste [10].

Fot. 1 Separating metals from combused electric cables and computer at Agbogbloshie (author's photo)

Feldt's research shows that two thirds of individuals exposed to fumes at Agbogbloshie complained about cough and one quarter about chest pain [5]. Agbogbloshie is one of the poorest Ghana slums. The average of daily income of an e-waste workers is around GH¢30 (around 8 USD) [8]. People are not educated enough about health consequences of the process of combustion and methods of protection from the toxic smoke. Due to small income and lack of health education the access to the medical services among inhabitants of this area is very low. No evidence of incidence of any diseases is causa by Lack of medical consulations and research at this area. Consumption of contaminated water and contaminated food grown in these areas indicates the risk of increased overall morbidity, especially for respiratory diseases and intoxication with heavy metals, dioxins, acid gases

and polycyclic aromatic hydrocarbons (PAHs). The human health implications of e-waste burning toxins on health of individuals working and living in the surroundings of Agbogbloshie e-waste site needs further investigation.

Conclusion

Burning of e-waste can result in exposure to a high amount of toxins: heavy metals, acid gases, polycyclic aromatic hydrocarbons (PAHs) and dioxins. Working and leaving at e-waste sites producing hazardous emissions can have damaging health effects. The human health implications of e-waste burning toxins on health of individuals working and living in the surroundings of Agbogbloshie e-waste site needs further investigation.

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