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Health threats resulting from soil and groundwater contamination in e-dumps on the Agbogbloshie example

Zagrożenia zdrowia wynikające z zanieczyszczeń gleby i wód gruntowych na terenie e-wysypisk śmieci na przykładzie Agbogbloshie

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Słowa klucz: e-wysypiska, Agbogbloshie, zanieczyszczenie gleby i wód gruntowych, Ghana

Key words: e-waste, Agbogbloshie, soil and groundwater pollution, Ghana

Streszczenie

Szybki wzrost gospodarczy, rosnąca urbanizacja i globalizacja spowodowały wzrost konsumpcji sprzętów elektronicznych i produkcji e-odpadów. Największe wysypiska e-odpadów znajdują się w krajach rozwijających się, w większości w pobliżu dużych miast o dużej populacji. Większość z nich znajduje się w pobliżu lokalnych targowisk i źródeł wody. Spalanie e-odpadów na terenie e-wysypisk początkowo skutkuje ekstremalnym miejscowym zanieczyszczeniem, a następnie migracją metali ciężkich do wód i kolejnych ogniw łańcucha pokarmowego przez skażoną wodę, warzywa, ryby, mleko i mięso. Negatywny wpływ na zdrowie pracowników e-wysypisk ma toksyczne wdychanie dymu i kontakt ze skórą, podczas gdy lokalna społeczność jest narażona na zanieczyszczenia metalami ciężkimi przez unoszący się na odległości kilkuset metrów dym, kurz oraz wodę pitną i żywność.

Summary

Rapid economic growth, an increasing urbanization and globalization caused increasing of consumption and production of e-waste. The biggest e-waste yards are located in developing countries, most of them nearby of big cities with a large population. Most of them are located nearby markets and water sources. Burning of e-waste at e-waste sites initially results in extreme localised contamination followed by migration of the heavy metals into waters and subsequent links of food chains by contaminated water, vegetables, fish, milk and meat consumption. E-waste workers suffer negative health effects through toxic smoke inhalation and skin contact, while the wider community are exposed to the heavy metals contaminants through smoke, dust, drinking water and food.

Introduction

Rapid economic growth, an increasing urbanization and globalization caused increasing of consumption and production of e-waste [1] E-waste is old, end-of-life electronic and electrical equipments or waste generated from any equipment running on electricity or a battery including computers, laptops, TVs, DVD players, mobile phones, MP3 players, etc., which have been disposed by users [2] The biggest e-waste yards are located in developing countries, most of them nearby of big cities with a large population. One of those places is Agbogbloshie in the city center of Accra, Ghana, West Africa. At e-waste yard eletronic and electrical devices are decomposed into first parts. Plastic coated wires and cables are burnt in order to isolate copper from plastics. Studies conducted in similar e-waste yards in China and India have shown that unregulated disposal of such wastes and their burning can contaminate soil, groundwater, and air. The effects of soil, groundwater and air pollution affect not only all those involved in e-waste processing but also the nearby communities [3] Burning of e-waste at e-waste sites initially results in extreme localised contamination followed by migration of the heavy metals into waters and subsequent links of food chains by contaminated water, vegetables,

fish, milk and meat consumption. E-waste workers suffer negative health effects through toxic smoke inhalation and skin contact, while the wider community are exposed to the heavy metals contaminants through smoke, dust, drinking water and food.

Meat and milk contamination with heavy metals

The Agbogbloshie area is a local dump site for any waste. Local cattle owners are feeding their cows and goats at Agbogbloshie e-waste yard where rests of food are common because big local food market is located nearby. Exposure for toxic smokes, consumption of food and water contaminated with heavy metals causes the accumulation of heavy metals in organisms of cattle. Contaminated milk and meat cause exposure of the subsequent links in the food chain, including humans. Heavy metals can be accumulated in cow and goat milk [4]. Research from 2016 indicates that lead and mercury were detected in analysed cow milk. Mercury concentration in cow milk samples was above the permissible limit [5]. The overall mean concentration of lead, arsenic, merkury, and nickel in human breastmilk samples were also above the permissible limits [5]. Consumption of food contaminated with heavy metals is one of major food chain routes for human exposure [6].

Soil contamination

In the e-waste areas, like Agbogbloshie, unprotected workers dismantle computers and T.Vs using Stones and heavy objects while searching of metals that can be sold. Most of the e-waste workers are children and youngsters. The remaining plastics, cables and casing are burnt at e-waste yards in developing countries [7]. Most of utilized electronics without doubt, contain toxic chemicals. Research indicates that the surface soil at the e-waste recycling area in Manila was polluted with copper, zinc and lead [8]. Carvanos research indicated that in Agbogbloshie of the 100 soil samples, more than half were above the US Environmental Protection Agency standard for lead in soil [9].The results in Agbogbloshie indicated that mean concentrations of the copper, cadmium, lead, iron, chrome and nickel were significantly highest near burning sites [10].

Fot. 1 Burning e-waste at Agbogbloshie e-waste yard (author's own photo)

Water contamination

Combustion process also groundwater pollution. [7] E-waste yards cause major risks by contamination of groundwater and nearby streams and rivers. Pollution of waters that have an estuary to the ocean can cause also ocean pollution. Heavy metals and inorganic acids can leach into waterways through wastewater or by air emissions and cause the risk of contaminating natural water and food resources such as soil, crops, drinking water, fish and livestock [11]. Consumption of drinking water and fishes contaminated with a high content of heavy metals can cause heavy metals accumulation in the subsequent links of the food chain, including humans.

Fot. 2 Leaving area of Agbogbloshie e-waste workers and their families (author's own photo)

Fruits and vegetables contamination

Heavy metals are no-biodegradable and may be deposited on the fruits and vegetales surfaces and then absorbed into the tissues of fruits and vegetables.[12] Heavy metal contamination of vegetables cannot be neglected. There is an evidence contaminants from e-wastes may be present in some agricultural or manufactured products for local consumption and export [13]. Watering plants with contaminated water from tanks in the vicinity of e-waste yards and toxic smokes may cause the incorporation of heavy metals into fruits and vegetables. Fruits and vegetables are important components of human diet. However, intake vegetables contaminated by heavy metals can cause a risk to the human health. Heavy metal contamination of food is one of the most important aspects which should be strictly controlled [14-21].

Conclusion

E-waste yards should not be located nearby big cities. Groundwater nearby of e-waste yards should be frequently controlled and in case of water contamination should be banned for food purposes. Food crops should not be located at the contaminated areas or nearby and should not be watered by contaminated water. Food quality in developing countries should be controlled.

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