Contamination of Heavy Metals in Soil and its Impact Around Formal and Informal E-waste Recycling Area in India

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Abstract

Informal recycling of e-waste not only impacts environment and the people living or working in that area but may also pollute the environment in nearby or far-flung areas. The present systemic review analyzes the environmental pollution effects of heavy metals and other pollutants from e-waste processing workshops in India. Study evaluates the possible exposure routes and human health risk due to effects of heavy metals in order to understand the evidence of causality between exposure to heavy metals from e-waste and human health outcomes.

Keyword- E-waste, Heavy Metals, Land Contamination

I. INTRODUCTION

This study was aimed to evaluate the pollution risk of heavy metal contamination by informal recycling of e-waste. The study put forward that prolonged informal recycling of e-waste may accumulate high concentration of heavy metals in surface soil, plants and ground water, which will be a matter of concern for both environmental and occupational hazards Abhishek (2016). This warrants an immediate need of remedial measures to reduce the heavy metal contamination of e-waste recycling sites. Pollution load index method will be discussed in present study. The outcome of this study can be useful for monitoring the environmental status of the e-waste recycling areas and to enable the development of appropriate measures in e-waste recycling areas.

In addition, many organic pollutants such as polyaromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCBs), Brominated flame retardants (BFRs), Polybrominated diphenyl ethers (PBDEs) and polychlorinated dibenzo-p-dioxin furans (PCDD/Fs)) are released into the environment during improper e-waste Abhishek (2016). Its impacts have played a major role in ecological risk assessments show that the heavily contaminated soil by PAHs is concentrated in the densely populated soil and number of residents subjecting to high health risk.

Rapid technology change, a tremendous growth in the field of information technology and low initial costs have resulted in a fast-growing surplus of electronic waste (e-waste) all over the world Pradhan (2014).

Mainly three kind of substances released during recycling (a) The substances used in manufacturing of electrical and electronic equipment (b) Those substance are used in recycling process (auxiliary substances) (c) By products which are formed during the transformation of primary constituents. The details diagrammatical representation of environmental medium.

II. LITERATURE REVIEW

About 80% of e-waste from developed countries is illegally exported to developing countries especially China, India, Nigeria, Ghana and Pakistan, because of the lower labor costs and lack of governmental regulations. Abhishek (2016) the indiscriminate disposal of MSW without covering is considered a dangerous practice in integrated waste management at the global level. Kanmani (2013)

Informal recycling of e-waste not only impacts environment and the people living or working in that area but may also pollute the environment in nearby or far-flung areas. Nowadays, e-waste recycling is catching attention because of increasing quantity and economic value attached to electronic and electrical products at the end of life. Pradhan (2014)

E-waste contains two major types of substances hazardous [(Cd, Cr, Pb, Hg, Chlorofluorocarbon, (PAHs Polycyclic aromatic hydrocarbon)], and non-hazardous (base metals such as Cu, Se, Zn and precious metals such as Ag, Au, and Pt) both types have potential negative environmental impacts. Abhishek (2016)

Sources of contamination includes mainly:

- Informal recycling of e-waste like acid bath and open air burning
- Dumping of e-waste, randomly throughout the study area
- Untreated industrial effluents discharged into nearby drainage Pradhan (2014)

Driven by profits, unregulated recycling methods/technologies, such as melting plastic to reduce waste volume, open-burning of wires and cables to recycle Cu, and acid leaching of waste printed circuit boards to recover precious metals (e.g. Au, Ag, Pt and Pd), are usually used. Sheng (2014)

Following are the key facts that reflect the Indian scenario of pollution of e-waste recycling

- Due to the rapid developmental activities, countries like India, today, face a fast increasing load of WEEE originating from both inland and through illegal imports. Abhishek (2017)
- In India, domestic E-waste is significant in addition to illegal imports.
- Over the last few decades, India has become a major destination for E-waste exports from the developed nations.
- Moreover, Indians have been generating rapidly increasing amounts of E-waste domestically. Almost 95% of e-waste recycling by these informal sector in India. Mohd (2015)
- Clearly there is a critical need of sustainable e-waste recycling.
- Although, Legal directives are given on E-waste Handling, Recycle & Disposal in E-waste (Management) Rules, 2016 as well as Implementation Guidelines for E-Waste (Management) Rules, 2016.

Pollution load index (PLI), also known as integrated pollution index, is used to assess the level of pollution at a site for a selected number of elements. To quantify the magnitude of contamination by metals in sediment, the Contamination Factor (CF) was determined. The CF indicates the factor by which background concentrations are exceeded at a site and is calculated as follows.

$$\mathrm{CF} = \frac{\text{Metal concentration of sediment}}{\text{Background concentration of sediment}} \qquad (1)$$

The Pollution Load Index (PLI) was used to determine the contamination loads of metals at the site.

$$\mathrm{PLI} = \sqrt[6]{(\mathrm{CF_{Fe}})\,(\mathrm{CF_{Mn}})\,(\mathrm{CF_{Cu}})\,(\mathrm{CF_{Zn}})\,(\mathrm{CF_{Cd}})\,(\mathrm{CF_{Pb}})} \qquad (2)$$

III. STUDY AREA

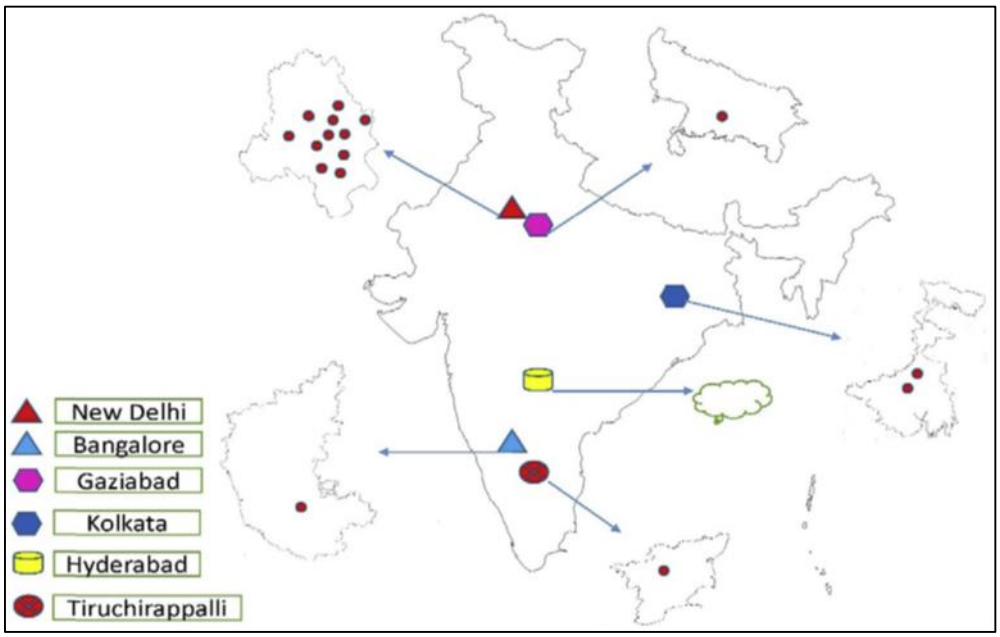

Fig. 1: Location of map with different cities having impact of e-waste recycling in India. Abhishek (2016)

IV. CONCLUDING REMARKS

This paper explores the environmental pollution from e-waste recycling at many small formal and informal workshops in India. The traditional e-waste processing through improper channels in India has resulted in the huge quantity of heavy metal and other pollutants into the natural environment which has a negative impact on natural ecosystems (soil, water, dust and plant). The contaminated soil can be remediated through integrated phytoremedial and microbial systems, followed by use of by-products as metal enrichments to soil. Further research is needed for better understanding of long-term impact of substance and integrated plant-microbial system application in sustainable management. After enforcement of E-waste rules 2016, the status of e-waste pollution. If one can get positive results from formal e-waste recycling and disposal sites compare to informal sites. Environmental Impact assessment of E-waste recycling unit by various pollution index methods. Impact of ground water contamination due to soil contamination. Further research is needed for better understanding of long-term impact of substance and integrated plant-microbial system application in sustainable management.

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