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# A Review on Unauthorized Dumping, Open Burning and E-Waste Estimation in India

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**Abstract:** Across the world, improper waste management practices such as open burning, illegal dumping and improper processing of electronic waste pose serious risks to public health and the environment. This review focuses on different mapping techniques for open burning and illegal disposal, along with approaches for calculating the production of e-waste. The study looks at citizen science programs, remote sensing methods, and field surveys for mapping garbage disposal behaviors. It also examines top-down and bottom-up approaches to estimating e-waste. The review emphasizes each approach's advantages and disadvantages while highlighting how it is suited for certain situations. Policymakers and waste management authorities can obtain important insights to create policies that effectively address these urgent concerns by integrating these techniques.

**Keywords:** Unauthorized dumping, Illegal dumping, Open dumping, E-waste, Public health

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## Introduction

Unauthorized dumping, open burning, and e-waste are pressing environmental issues that pose significant threats to ecosystems and human health. Illegal/unauthorized dumping refers to the improper disposal of waste materials in areas that are not designated or approved for waste disposal (Mohan and Joseph, 2021). This practice not only leads to environmental contamination but also hinders the sustainability of solid waste management systems (Saaty *et al.*, 2019; Shwetmala *et al.*, 2021). Open burning, on the other hand, involves the combustion of waste materials in open areas, releasing toxic pollutants into the air which also enhance the greenhouse gases (GHGs) contribution to the environment (Harit *et al.*, 2019). This practice contributes to air

pollution and poses respiratory risks to nearby communities (Siddiqua *et al.*, 2022). Additionally, the improper management of electronic waste, or e-waste, has become a growing concern globally (Wang *et al.*, 2020). E-waste contains hazardous materials that can contaminate soil, water, and air if not properly handled and disposed off (Lucier and Gareau, 2019). These issues not only have negative impacts on the environment but also on public health, as exposure to hazardous substances can lead to severe health problems such as respiratory illnesses, neurological disorders, and even cancer (Triassi *et al.*, 2015). Few countries may lack the necessary infrastructure and resources to effectively manage and regulate waste disposal practices. Furthermore, there is a need for more comprehensive risk assessment and enforcement strategies to discourage illegal dumping and open burning. In recent years, there has been a growing recognition of the importance of extended producer responsibility laws, which hold electronics manufacturers accountable for the proper recycling and disposal of electronic waste (Braun *et al.*, 2005).This study aims to identify and map unauthorized dumping and open burning sites and estimate the volume of e-waste generated to aid in the development of effective waste management strategies.

## Environmental Impact of Illegal Dumping, Open Burning, and E-Waste

The environmental impact of these activities is far-reaching and can result in soil and water contamination, air pollution, and harm to wildlife and human health. Illegal dumping can introduce hazardous substances into the soil and water, leading to long-term ecological damage and threatening the health of local communities (Kahhat *et al.*, 2008). Open burning releases toxic fumes and particulate matter into the air, contributing to air pollution and respiratory issues sich as asthma, lung cancer, bronchitis, and pneumonia (Triassi *et al.*, 2015). E-waste, which often contains heavy metals and other harmful components, can contaminate soil and water if not properly managed (Alabi *et al.*, 2021).

It is essential to understand the gravity of these environmental issues and their potential to cause irreparable harm. Addressing these problems requires a comprehensive approach that encompasses not only enforcement measures but also education and awareness initiatives to promote responsible waste management practices (Loughland *et al.*, 2003).

## Unauthorized Dumping and Open Burning in India

The inadequate disposal and uncontrolled incineration of trash in India provide substantial environmental and health obstacles. Unauthorized dumping is the act of improperly disposing of rubbish in uncontrolled regions, whereas open burning is the process of burning waste in outdoor settings, which leads to the emission of pollutants into the atmosphere (Estrellan and Iino, 2010). India produces around 43 million tons of solid garbage each year, a significant amount of which is illegally dumped or burned because of insufficient waste management infrastructure. Research suggests that around 20-25% of this material is unlawfully discarded or incinerated in the open. Open burning is common in metropolitan areas with inadequate waste collection services. For example, Delhi has seen increased levels of open rubbish incineration, which greatly adds to air pollution in the immediate area. In 2021, the northern region of Delhi was responsible for around 16.7% of instances when waste was burned. Unlawful dumping is caused by inadequate garbage collection infrastructure, high rates of waste output, and socio-economic factors (Talyan *et al.*, 2007). Regions characterized by a greater concentration of people and a lack of adequate waste management facilities are more susceptible to engaging in illicit dumping activities. In addition, persons from low-income origins are more inclined to participate in these activities because of the financial strain linked to using professional trash management services. To address these problems, it is crucial to enhance waste management systems, raise public

awareness, and enforce environmental legislation more rigorously. By allocating resources towards the development of waste management infrastructure and recycling facilities, as well as implementing educational initiatives for the community, India can effectively decrease the occurrences of unlawful dumping and open burning (Kumar *et al.*, 2017).

## Challenges in Unauthorized Dumping, Open Burning and E-waste Management

The illicit dumping and incineration of waste in India pose several problems, significantly impacting environmental well-being, air purity, and overall public welfare.

### *Inadequate Waste Management Infrastructure*

The lack of adequate garbage collection and disposal infrastructure is a widespread problem in many regions, especially in rural and peri-urban areas. Consequently, unlawful dumping is frequent due to the lack of simple methods for locals to dispose of their garbage correctly. The lack of adequate recycling infrastructure results in the dumping or cremation of a substantial proportion of recyclable material, hence worsening the issue (Ichinose and Yamamoto, 2011).

### *Socio- Economic Factors*

Communities with lower socioeconomic status and little awareness of the environmental and health risks associated with improper waste disposal are more likely to engage in illegal dumping and open burning. The excessive costs associated with formal trash disposal services may discourage persons from using these services, leading to the unauthorized dumping of waste (Abrate *et al.*, 2012).

### *Regulatory and Enforcement Issues*

Often, there is little enforcement of existing waste management laws, allowing illegal dumping and open burning to continue without significant consequences. While policies may be formally recorded, their implementation and supervision may lack effectiveness, resulting in inadequate waste management protocols (Wilson *et al.*, 2012).

### *Environmental and Health Impacts*

The act of burning rubbish in a public setting releases a significant number of pollutants, such as tiny particles, carbon monoxide, and dangerous gases. As a consequence, there is a decrease in the quality of air, leading to health issues such respiratory diseases and cardiovascular illnesses. Improper disposal may lead to the formation of leachate, which contaminates soil and water reservoirs, hence affecting agricultural productivity and the availability of potable water (Obi *et al.*, 2016).

### *Urbanization and Population Growth*

The fast process of urbanization and the growth of population in Indian cities have led to a significant increase in the generation of garbage, intensifying the strain on already overwhelmed waste management facilities. Urbanization often reduces the available acreage for proper garbage disposal facilities, leading to a rise in unlawful dumping on the edges of cities and rural areas (Vergara and Tchobanoglous, 2012).

### *Public Attitudes and Behaviors*

The general population often lacks understanding about the harmful repercussions of improper disposal and the act of openly burning waste materials. The community's efforts to educate and engage residents are sometimes insufficient in modifying deeply entrenched behaviours and attitudes towards waste management. Incinerating waste continues to be a prevalent method in several areas, despite its adverse consequences. This emphasizes the need of educational and therapeutic initiatives that demonstrate sensitivity towards and exhibit reverence for many cultures (Edge and Lemetyinen, 2019).

### *Estimating E-waste in India*

India ranks third in worldwide e-waste production, behind China and the United States. According to the Central Pollution Control Board (CPCB), India is expected to produce around 1.71 million metric tons of electronic garbage (e-waste)

Table 1: Studies reported on unauthorized dumping and open burning

| Data | Value | Reference |
|---|---|---|
| Number of Open Burning Incidents per Year | 30,000 (estimated) | Central Pollution Control Board (2019) |
| Annual E-waste Generation | 2 million tones (approx.) | Indian Institute of Chemical Technology (2018) |
| E-waste Recycling Rate | 5% | Ministry of Environment, Forest and Climate Change (2022) |
| Informal Sector Involvement in E-waste | 95% | Dutta and Goel (2021) |
| Percentage of E-waste Sent to Formal Recycling Centers | 10% | Joon *et al.* (2017) |

by 2023. The analysis reveals a substantial increase in the generation of electronic waste, rising from over 708,000 metric tons during the 2017-2018 period to over 1.6 million metric tons by the 2021-2022 timeframe. Computer equipment is the predominant source of electronic trash (e-waste) in India, accounting for around 70% of the total volume (Heeks *et al.*, 2014). The exponential expansion of the IT and communication industries, along with continuous technological advancements, has substantially augmented the volume of electronic waste (Kaushik and Herat, 2020). Over 95% of the total e-waste created in India is managed by the informal sector, which plays a vital role in its management. The lack of adequate safety and environmental regulations in informal management often results in several health and environmental concerns.

Individuals employed in the informal sector have potential exposure to dangerous substances like lead and mercury, without sufficient protective measures (Teare *et al.*, 2015). According to the legislation, companies that make, generate, repair, and recycle electronic waste are required to officially register with the Central Pollution Control Board (CPCB) and handle the waste in a way that is beneficial to the environment. The primary objective of the new regulation is to include the informal sector into the current e-waste disposal infrastructure, therefore improving overall effectiveness and ensuring environmental security (Chi *et al.*, 2010).

### *Informal Sector Dominance*

The informal sector in India plays a vital role in the management of e-waste, acting autonomously outside of established legal frameworks. There is a pervasive absence of precise reporting and comprehensive documentation in this industry on the quantity of electronic trash that is handled (Nnorom and Odeyingbo, 2020). Consequently, there are significant deficiencies in the collection of data. The informal sector utilizes rudimentary and unregulated methods to recycle and dispose of electronic waste, without adhering to traditional processes or maintaining proper paperwork. As a result, efficiently tracking electronic waste becomes a difficult task (Kiddee *et al.*, 2013).

### *Data Collection and Reporting Issues*

Oftentimes, there is an absence of uniformity in the data presented by various stakeholders, such as manufacturers, recyclers, and government bodies (Table 1). This discrepancy may arise from differences in technique and the lack of a uniform reporting mechanism (Eunomia, 2018). The current data collection endeavors may not include all classifications of electronic and electrical equipment (EEE). The focus is often centered on prominent categories such as computers and mobile phones, thereby overlooking other significant contributions to electronic waste

(Shahabuddin *et al.*, 2022).

### *Regulatory and Policy Challenges*

While the E-Waste (Management) Rules exist, their enforcement is sometimes inadequate. This leads to noncompliance among manufacturers and recyclers, resulting in a decrease in accurate reporting of e-waste creation and recycling operations. The current legislative frameworks may not possess the necessary comprehensive-ness to adequately tackle all facets of e-waste management, such as informal sector operations, resulting in inadequate data (Ardi and Leisten, 2016).

### *Technological and Infrastructures Limitations*

The current infrastructure for the collection, classification, and recycling of electronic waste is inadequate, especially in rural and semi-urban areas. This inadequacy hinders the precise collection and monitoring of data. The lack of advanced technology for tracking and managing electronic waste might result in discrepancies in data and difficulties in monitoring the life cycle of electronic equipment (Huang *et al.*, 2020).

### *Public Awareness and Participation*

Public awareness of the need of properly discarding electronic waste and the accompanying responsibility to report it is generally lacking. As a consequence, this leads to improper techniques for disposing of electronic trash and inadequate adherence to established procedures for managing electronic waste. Consumers sometimes dispose of electronic garbage via informal channels or keep outdated equipment at home, which is not included in official records (Ohajinwa, 2018).

### *Economic Factors*

Effective management of electronic trash (e-waste), which entails precise data collecting, requires substantial financial resources. Both public and commercial sector institutions may face budgetary limitations that restrict their capacity to invest in extensive data collecting systems. The informal sector, motivated by financial rewards, often circumvents regular reporting to prevent regulatory oversight and the accompanying expenses, leading to mistakes in statistics (Sunstein, 2022; Wu, 2023).

## Methods of Mapping of Unauthorized Dumping and Open Burning

Table 2 illustrates the various methods of mapping of unauthorized dumping and open Burning adopted by various researchers

### Remote Sensing

For the purpose of mapping illegal dumping and open burning operations on a broad scale, remote sensing provides an invaluable tool. Through spectrum analysis, suitable dumping sites and open burning hotspots can be effectively identified using satellite data and aerial photography, taking into account factors such as vegetation cover, soil properties, and thermal signatures (Ongondo *et al.*, 2011). However, there are certain drawbacks, including reliance on meteorological conditions, the possibility of misclassification because of comparable spectral features, and the requirement for validation data derived from ground trothing (Mohan *et al.*, 2020).

### Initiatives for Citizen Science

Programs for citizen science involve the public in data gathering and provide an economical method. Through smartphone apps or internet platforms, crowdsourcing platforms enable people to report open burning occurrences and dumping sites. Real-time data and public awareness are provided by citizen science, albeit the accuracy of the data varies based on participant participation and training levels (Lu *et al.*, 2019).

### *E-waste Quantification*

Two methods are used to e-waste estimation, advantages and dis-advantages of both the methods are discussed in Table 3 and the details of methods given below:

### *The Bottom-Up Method*

In-depth information on particular waste streams is necessary for the bottom-up approach to e-waste estimation (Nnorom and Osibanjo, 2008).

Table 2: Methods of mapping of unauthorized dumping

| Methods | Advantages | Disadvantages | Use Cases | References |
|---|---|---|---|---|
| Remote Sensing (Satellite Imagery & Aerial Photography) | Large-scale coverage, cost-effective, objective data | Dependence on weather conditions, potential for misclassification, need for ground-truthing | Identifying hotspots, monitoring trends | Robinson (2009) |
| Citizen Science Initiatives | Cost-effective, real-time data collection, public awareness raising | Data accuracy variability, requires engagement strategies | Identifying dumping sites, fostering community involvement | Böhringer and Jochem (2007) |
| On-ground Surveys | High data accuracy, detailed site characterization | Time-consuming, resource-intensive | Comprehensive site assessment, enforcement activities | Lundgren (2012) |

Table 3: Method of estimation of e-waste

| Method | Advantages | Disadvantages | Use Cases | References |
|---|---|---|---|---|
| Bottom-up Approach | Detailed data on specific waste streams, facilitates targeted strategies | Data collection complexity, limited scope | Identifying priority E-waste categories, planning local collection & processing facilities | Yang *et al.* (2021) |
| Top-down Approach | National-level estimates, facilitates policy development | Relies on existing data accuracy, potential for bias | Macro-level trends, resource allocation decisions | Breivik *et al.* (2014) |

This entails monitoring electronic device sales statistics, examining the movement of materials through the economy, and taking product lifespans into account. This method facilitates targeted waste management strategies by offering comprehensive information on particular e-waste types. However, gathering data can be difficult and necessitate cooperation from a range of stakeholders across the electronics lifespan (Du *et al.*, 2018).

The bottom-up strategy is dependent on data, including product lifespans, material flow studies within the economy, and sales figures of electronic equipment. Top-down strategies make use of economic indicators and national information on recycling rates, GDP, and ownership of electronic devices(Lepawsky and McNabb, 2019).

### *The Top-Down Method*

To estimate the amount of e-waste generated nationally, the top-down technique makes use of economic indicators and national statistics. Large-scale planning and the creation of national policies for the management of e-waste are facilitated by this approach. However, the quality of the available data, which may be biased or have restrictions, has a major bearing on how accurate

top-down estimations (Baldé *et al*., 2017).

### Consolidation and Suggestions

To gain a thorough understanding of trash disposal procedures and the development of e-waste, it is imperative to integrate several methodologies. A comprehensive picture of the geographic distribution and characteristics of open burning and illegal dumping can be obtained by combining data from remote sensing with reports from citizen scientists and field surveys. Similar to this, top-down and bottom-up techniques to e-waste estimation can be combined to provide national-level and detailed insights, respectively (Wang *et al.*, 2019).

## Conclusion

An analysis of the problem of illegal disposal, incineration, and estimation of electronic waste in India reveals significant environmental and public health challenges. Inadequate waste management infrastructure, socio-economic factors, and inefficient regulatory enforcement all contribute to the occurrence of unlawful dumping and open burning, resulting in substantial air pollution and environmental degradation. Moreover, the assessment of electronic waste is impeded by the widespread existence of the informal sector, the lack of dependable data collection, and technological limitations. Hence, the given data lacks precision and the recycling procedures are ineffective. In order to tackle these issues and promote sustainable waste management practices, it is essential to adopt comprehensive measures that include public education, legislative reforms, technological advancements, and improved infrastructure.

## Ethical Statement

This is a review article hence no Ethical Approval needed.

## Author Contributions

Each author has contributed equally to the study's planning, analysis, writing, and editing. All authors have read and agreed to the published version of the manuscript.


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## Conflict of Interest

The authors declare no conflicts of interest.

## References


Abrate G, Erbetta F, Fraquelli G and Vannoni D. (2014) The costs of disposal and recycling: an application to Italian municipal solid waste services. Regional Studies 48(5): 896-909.

Alabi OA, Adeoluwa YM, Huo X, Xu X and Bakare AA. (2021) Environmental contamination and public health effects of electronic waste: an overview. J Environ Hlth Sci Engineer. 19: 1209-1227.

Ardi R and Leisten R. (2016) Assessing the role of informal sector in WEEE management systems: A system dynamics approach. Waste Managem. 57: 3-16.

Bai X, Shi K and Liu H. (2010) Landfill site selection using spatial information technologies and AHP: A case study in Beijing, China. J Environ Managem. 91(3): 654-668.

Böhringer C and Jochem PE. (2007) Measuring the immeasurable-- A survey of sustainability indices. Ecol Economics 63(1): 1-8.

Braun CS and Dirckinck-Holmfeld KR. (2005) Implementing WEEE in Denmark-has extended producer responsibility been the outcome?. In: Proc 2005 Int Conf Asian Green Electronics, 2005. AGEC, pp. 67-75.

Breivik K, Armitage JM, Wania F, Jones KC and Hungerbühler K. (2014) Tracking the global generation and exports of e-waste: Do existing estimates add up? Environ Sci Technol. 48(15): 8735-8743.

Chi X, Streicher-Porte M, Wang MY and Reuter MA. (2011) Informal electronic waste recycling: A sector review with special focus on China. Waste Managem. 31(4): 731-742.

Citro CF, Auerbach J, Evans KS, Groshen EL, Landefeld JS, Mulrow J, Petska T, Pierson S, Potok N, Rothwell CJ, Thompson J, Woodworth JL and Wu E. (2023) What protects the autonomy of the federal statistical agencies? An assessment of the procedures in place to protect the independence and objectivity of official U. S. Statistics. Statistics Public Policy. doi: 10.1080/2330443X.2023.2188062.

Du E, Ren A and Lei Y. (2018) Use of remote sensing and GIS in monitoring and predicting the expansion of informal settlements in cities of developing countries. Habitat Int. 75: 14-24.

Dutta D and Goel S. (2021) Understanding the gap between formal and informal e-waste recycling facilities in India. Waste Managem. 125: 163-171.

Edge D and Lemetyinen H. (2019) Psychology across cultures: Challenges and opportunities. Psychology Psychother Theory Res Practice 92(2): 261-276.

Estrellan CR and Iino F. (2010) Toxic emissions from open burning. Chemosphere 80(3): 193-207.

Eunomia (2018) UK Overestimates Plastic Recycling by a Third. https://eunomia.eco/latest-news/uk-overestimates-plastic-recycling-by-a-third/

Giusti L. (2009) A review of waste management practices and their impact on human health. Waste Managem. 29(8): 2227-2239.

Heeks R, Subramanian L and Jones C. (2015) Understanding e-waste management in developing countries: Strategies, determinants, and policy implications in the Indian ICT sector. Information Technol Develop. 21(4): 653-667.

Huang H, Tong X, Cai Y and Tian H. (2020) Gap between discarding and recycling: Estimate lifespan of electronic products by survey in formal recycling plants in China. Resources Conserv Recycling 156: 104700.

Ichinose D and Yamamoto M. (2011) On the relationship between the provision of waste management service and illegal dumping. Resource Energy Economics 33(1): 79-93.

Indian Institute of Chemical Technology (2018) Study on e-waste generation in India.

Joon V, Shahrawat R and Kapahi M. (2017) The emerging environmental and public health problem of electronic waste in India. J Hlth Pollut. 7(15): 1-7.

Kahhat R, Kim J, Xu M, Allenby B and Williams E. (2008) Exploring e-waste management systems in the United States. Resources Conserv Recycling 52(7): 955-964.

Kaushik PR and Herat S. (2020) Current state of e-waste management in India. Int J Environ Waste Managem. 25(3): 322-339.

Kerr JT and Ostrowski M. (2003) Mapping lakes in heavily forested landscapes using Landsat TM data and a decision tree classifier. Int J Remote Sensing 24(17): 3467-3479.

Kiddee P, Naidu R and Wong MH. (2013) Electronic waste management approaches: An overview. Waste Managem. 33(5): 1237-1250.

Kumar S, Smith SR, Fowler G, Velis C, Kumar SJ, Arya S, Rena, Kumar R and Cheeseman C. (2017) Challenges and opportunities associated with waste management in India. R Soc Open Sci. 4(3): 160764.

Lepawsky J and McNabb C. (2019) Mapping e-waste coverage in national and international legal and policy contexts: The case of Canada. Canadian Geographer 63(3): 408-422.

Loughland T, Reid A, Walker K and Petocz P. (2003) Factors influencing young people's conceptions of environment. Environ Edu Res. 9(1): 3-19.

Lu D, Qiao Y, Dong G and Kang J. (2019) High-resolution mapping of informal urban settlements in developing countries using machine learning: A case study from Pune, India. Remote Sensing Environ. 231: 111241

Lucier CA and Gareau BJ. (2019) Electronic waste recycling and disposal: an overview. In: Assessment and management of radioactive and electronic wastes, (ed.) Hosam El-Din Saleh. ISBN 978-1-78985-117-5.

Lundgren K. (2012) The global impact of e-waste: addressing the challenge. International Labour Office. Programme on Safety and Health at Work and the Environment.

Ministry of Environment, Forest and Climate Change (MoEFCC) (2022) The E-Waste (Management) Rules, 2022. Government of India. E-Waste-Management-Rules-2022-English.pdf

Mohan S and Joseph CP. (2021) Potential hazards due to municipal solid waste open dumping in India. J Indian Institute Sci. 101(4): 523-536.

Mohan S, Modi V and Kandlikar M. (2020) Unauthorized electronic waste processing in Delhi's informal sector: The growing specter of environmental health risks. Environ Sci Technol. 54(12): 7378-7388

Nnorom IC and Odeyingbo OA. (2020) Electronic waste management practices in Nigeria. In: Handbook of electronic waste management, Butterworth-Heinemann, pp. 323-354.

Nnorom IC and Osibanjo O. (2008) Electronic waste (e-waste): Material flows and management practices in Nigeria. Waste Managem. 28(8): 1472-1479.

Obi FO, Ugwuishiwu BO and Nwakaire JN. (2016) Agricultural waste concept, generation, utilization and management. Nigerian J Technol. 35(4): 957-964.

Ohajinwa CM. (2018) Environmental and health impacts of informal electronic waste recycling. Doctoral Thesis, Univ Leiden.

Ongondo FO, Williams ID and Cherrett TJ. (2011) How are WEEE doing? A global review of the management

of electrical and electronic wastes. Waste Managem. 31(4): 714-730.

Robinson BH. (2009) E-waste: an assessment of global production and environmental impacts. Sci Total Environ. 408(2): 183-191.

Saaty TL, Kadic-Maglajlic S and Vrankic M. (2019) Reflections on e-waste. Sci Total Environ. 653: 877-882.

Shahabuddin M, Uddin MN, Chowdhury JI, Ahmed SF, Uddin MN, Mofijur M and Uddin MA. (2023) A review of the recent development, challenges, and opportunities of electronic waste (e-waste). Int J Environ Sci Technol. 20(4): 4513-4520.

Shwetmala K, Chanakya HN and Ramachandra TV. (2021) Pattern, characterization and quantification of unauthorized waste dump sites: A case study of Bangalore. J Solid Waste Technol Managem. 47(2): 362-370.

Siddiqua A, Hahladakis JN and Al-Attiya WAK. (2022) An overview of the environmental pollution and health effects associated with waste landfilling and open dumping. Environ Sci Pollut Res. 29(39): 58514-58536.

Sunstein CR. (2022) "We Test": An imagined regulatory future. J Benefit-Cost Analysis 13(3): 269-280.

Talyan V, Dahiya RP and Sreekrishnan TR. (2008) State of municipal solid waste management in Delhi, the capital of India. Waste Managem. 28(7): 1276-1287.

Teare J, Kootbodien T, Naicker N and Mathee A. (2015) The extent, nature and environmental health implications of cottage industries in Johannesburg, South Africa. Int J Environ Res Public Hlth. 12(2): 1894-1901.

Triassi M, Alfano R, Illario M, Nardone A, Caporale O and Montuori P. (2015) Environmental pollution from illegal waste disposal and health effects: A review on the "Triangle of Death". Int J Environ Res Public Hlth. 12(2): 1216-1236.

Vergara SE and Tchobanoglous G. (2012) Municipal solid waste and the environment: a global perspective. Annual Rev Environ Resources 37: 277-309.

Wang F, Yu L and Wu A. (2021) Forecasting the electronic waste quantity with a decomposition-ensemble approach. Waste Managem. 120: 828-838.

Wilson DC, Parker D, Cox J, Strange K, Willis P, Blakey N and Raw L. (2012) Business waste prevention: A review of the evidence. Waste Managem Res. 30(9 suppl): 17-28.