



Burning Plastic Polymers Waste Outdoors Is A Serious Global Health Concern

[1]* Dr.Sumit Kumar [2] Sadhna [3] Anil Kumar

[1] Assistant professor Chemistry, [2] Assistant professor Geography, Baby Happy Modern P.G. College Hanumangarh (Raj.), [3] Research scholar, Tantia University, Sri Ganganagar

Abstract: Across the world, it is common practice to burn mixed garbage containing plastics outdoors, which releases harmful gas emissions and ash deposits that are bad for the environment and human health. Plastic pollution is a serious environmental issue, but it's frequently confused with plastic trash, and burning plastics outside contributes to pollution in the air, land, and water. Burning plastics outside emits a lot of harmful pollutants that harm human health and the environment, such as fine particles and black carbon, which plays a major role in climate change. When burning plastic garbage, the most harmful chemicals that are frequently discharged into the air include Nitrogen oxides, sulphur dioxide, volatile organic compounds (VOCs), and polycyclic organic matter (POMs), polychlorinated biphenyls (PCBs), benzo(a)pyrene (BAP) and polyaromatic hydrocarbons (PAHs), Toxic substances including dioxin and heavy metals and furans; prolonged exposure to these compounds can cause cancer and disrupt hormone processes. Burning garbage can have long-term negative effects on health. Thus, efforts to enhance public awareness of plastic pollution frequently result in a rise in open burning. From this vantage point, we highlight this crucial but frequently disregarded aspect of plastic pollution as a pressing worldwide health concern. We also support initiatives to educate people about the dangers of open burning and stress the need to phase out some particularly harmful plastics from high-churn, single-use consumer products. Using a harm reduction strategy, we then recommend taking preventative steps to lessen the health hazards associated with open burning by concentrating on the plastics and packaging materials that burn with the greatest toxicity.

Keywords: Plastic Pollution, Waste, Air Pollution, Plastic Burning

Introduction: Plastic pollution has become one of the most important environmental issues facing our day, and media attention to the issue has increased dramatically. Two distinct stories have been presented to the public by the media. The first story is told through pictures of plastic-eating animals that die, heaps of plastic waste on land, and plastics floating in the water. The second storyline presents visuals of inventive plastic recycling and reuse initiatives together with clean-up activities, giving the impression that significant effort are being made to address the issue. The effectiveness of these remedial initiatives is debatable, though. In actuality, less than 10% of plastic garbage gets recycled, despite the fact that these initiatives lessen visible plastic waste in the surrounding environment, increase awareness of our rising plastic footprint, and generate hope. Under the pretexts of recycling, post-consumer plastics gathered in higher-income nations are routinely shipped to low- and middle-income nations (LMICs), exacerbating the already dire situation of plastic waste. The problems that LMICs already have with their own plastic garbage are made worse by this approach. The majority of press coverage on plastic pollution has highlighted the dangers trash poses to animals in the ecosystem. Comparatively, the techniques used to dispose of plastics and the health effects that follow have received significantly less coverage in the media. What happens to the plastic debris that local communities gather is rarely mentioned in news reports about it. We discovered via our multisite ethnographic investigation that open fires are frequently used to burn this garbage. Ironically, when people and communities burn the rubbish gathered during

clean-up efforts, anti-litter campaigns and actions bringing attention to the issue of plastic pollution frequently result in an increase in the number of open burning.

Besides being a major cause of air pollution, open burning of mixed wastes has a number of negative consequences on the environment and public health. When it comes to open burning, plastic waste is especially problematic. According to a study 90% of the black carbon released from burning garbage is attributable to two forms of plastic: polyethylene terephthalate and polystyrene. According to several studies burning plastics in the open is linked to a higher risk of heart disease, respiratory problems, neurological disorders, nausea, skin rashes, numbness or tingling in the fingers, headaches, memory loss, and confusion. Certain harmful pollutants, such as polycyclic aromatic hydrocarbons, have been connected to birth abnormalities and cancer. Open burning releases ash into the air, contaminating the groundwater, the food chain, and the land. In addition to adhesives and coatings, additives "such as fillers, plasticizers, flame retardants, colorants, stabilizers, lubricants, foaming agents, and antistatic agents" are commonly found in plastic packaging, which makes up around 40% of all plastics manufactured worldwide. Metal-containing additives are very risky. Examples of these include cadmium, chromium, lead, mercury, cobalt, tin, and zinc.

Plastic polymers undergo several physical and chemical changes when they burn, such as:

- **Thermal degradation:** An igniting source heats the plastic, raising its temperature. Oxidative degradation: When plastic is heated, it starts to break breakdown.
- **Total oxidation:** Products with a lower molecular weight are produced as the plastic breaks down.
- **Gas mixture:** At least 60% nitrogen and very little oxygen make up the flames' basis.
- **Products:** Lower hydrocarbons, methylethacrylate, and carbon and water oxides are among the by-products of burning.

Plastic burning may be harmful to both the environment and human health. When plastic burns, several pollutants are emitted, such as phthalates, bisphenols, and micro-plastics. These poisons have the ability to interfere with reproductive, endocrine, and neurodevelopment processes. In general, plastics are regarded as common combustibles, much like leather and wood. Their flammability, however, varies according on the particular kind of plastic.

Burning waste openly: Around two billion people on the planet do not have access to municipal solid trash collection. Usually, these wastes are burned in the open or buried, or they are disposed of in rivers or on land. It is anticipated that the number of plastics burnt is equal to the total quantity of plastics released into the air or water. It is believed that between 40% & 65% of all municipal solid garbage is burned openly in LMICs. Air pollutants, particularly reactive trace gases and particulate matter (PM), are mostly produced by open burning. For instance, in China, emissions of PM 10 micrometers or smaller (PM10) from burning household garbage outside account for 22% of all anthropogenic PM10 emissions that are reported from China. Plastics are a particularly hazardous waste stream when subjected to open burning. According to one research, polystyrene and polyethylene terephthalate are the two polymers responsible for 90% of the black carbon released when garbage is burned. Basic calculations have indicated that the quantity of black carbon emitted during the open burning of wastes is not insignificant, despite the absence of good measurements of this amount. This suggests a connection between climate change and the harmful health impacts of open burning of wastes. In addition to various health problems, certain emissions, such as persistent organic pollutants like polycyclic aromatic hydrocarbons and dioxins and dioxin-related substances, have been connected to skin lesions, cancer, immunological problems, and birth abnormalities. There is also a link between the open burning of plastics and a higher risk of respiratory problems, neurological diseases, and heart disease. Open burning can release toxicants like as dioxins and heavy metals into the air, which then land on the ground and pollute the groundwater, soil, and adjacent species as well as their food chains. According to one study, improper management of garbage results in 400,000-1,000,000 fatalities worldwide each year. Plastic waste was shown to be a possible contributing factor in a considerable number of these deaths.

In many parts of the worldwide south as well as in the Global North, burning in the open is a regular practice. It's possible that open burning will occur more frequently and to a greater degree given the patterns of rising worldwide plastic production and use. Despite laws prohibiting it, open burning is

nevertheless widely used in places like Zambia, the Philippines, Indonesia, India, and the Philippines, where our anthropological fieldwork has been conducted.

It is impossible to hold communities and individual customers accountable for open burning activities. We discovered that, in many communities, garbage pickup is either rare or nonexistent and, when it occurs, can be costly for homes. Collected trash is frequently sent to disposal sites that are overflowing with material. Low-value post-consumer plastic wastes from high-income nations are simultaneously sent to low-income countries (LMICs) under the pretence of recycling, despite the fact that recycling does not always occur. Post-consumer plastic garbage is frequently dumped in open landfills that are soon overflowing, on vacant lots, and along the sides of roadways. In all such cases, plastic wastes are burnt outside when they get to the stage where they are considered an annoyance due to aesthetics or contamination.

Implications on health: Depending on the kind of plastic being burnt, open burning might have different health effects. When burnt, some plastics emit very hazardous or carcinogenic chemicals that provide serious health hazards (see Table 1). Few people are aware of the extent of the health and environmental risks associated with burning plastics, including polyvinyl chloride (PVC) and Styrofoam (polystyrene), a polystyrene (PS) product that, when burned outside, releases harmful dioxins, chlorinated furans, or styrene gas. This was discovered during our fieldwork. The main issue raised by interviewees was the dense smoke and unpleasant odour from burning various plastics; this was seen as more of a temporary annoyance than a long-term risk. Even after the smoke and smell have cleared, the toxicants produced by burning plastics might still be present. Furthermore, it has been discovered that small-scale community burning of mixed plastic wastes presents larger health hazards to people than burns at big dumping grounds due to the increased frequency, higher chance of exposure to humans, and lower dispersive dilution brought on by ground-level emissions.

Table 1: Examples of hazardous chemicals released upon the open burning of a variety of plastics.

Type of plastic	Common forms	Hazardous chemicals released upon burning	Health effects
Polyvinyl Chloride (PVC)	Drainpipes, blister packs, children's toys, bottles and jugs, etc.	Carbon monoxide, dioxins, chlorinated furans	Carcinogenic, birth defects, respiratory disorders, etc.
Polystyrene (PS), styrene	Foam cups, meat trays, egg cartons, plastic forks and spoons, etc.	Styrene gas, acrolein, hydrogen cyanide	Carcinogenic, eye and mucous membrane damage, narcosis, death in high doses
Polyurethane (PU)	Wood finishes, sealants, adhesives, curtains, etc	Carbon monoxide, hydrogen cyanide, phosgene	Death in high doses
Polyethylene Terephthalate (PET or PETE)	Drink bottles, cosmetic packaging, water bottle	Methane, ethane, ethyne, formaldehyde, carbon dioxide, carbon monoxide, polycyclic aromatic hydrocarbons	Mild to moderate respiratory irritation, carcinogenic and mutagenic effects
Polypropylene (PP)	Medicine, yogurt, condiments, other food and beverage packaging	Naphthalene, methylnaphthalene, biphenyl, fluorene, phenanthrene, methylphenanthrene,	Mild to moderate respiratory irritation, carcinogenic and mutagenic

		anthracene, pyrene, and benzo[a]fluorene, polycyclic aromatic hydrocarbons	effects
High-Density Polyethylene (HDPE)	Shampoo bottles, grocery bags, flower pots, cereal box liners	Olefins, paraffin, aldehydes, and light hydrocarbons, carbon monoxide, polycyclic aromatic hydrocarbons	Mild to moderate respiratory irritation, carcinogenic and mutagenic effects
Low-Density Polyethylene (LDPE)	Assorted beverage and food, frozen food, frozen juice, and milk packaging	Olefins, paraffin, aldehydes, and light hydrocarbons, carbon monoxide, polycyclic aromatic hydrocarbons	Mild to moderate respiratory irritation, carcinogenic and mutagenic effects

In 2017, pollution was shown to be the cause of 15% of all deaths and 275 million years of life with a handicap adjusted for inflation. One major source of this pollution is the open burning of plastic garbage. Additionally, it is a factor that is frequently overlooked: open burning of household garbage is one source of emissions that is not included in standard emissions inventories. Although there are laws against open burning, they have not shown to be successful due to the absence of accessible and safe disposal options, the transportation of low-value plastic trash to low-income countries, and the general lack of knowledge about the harms open burning poses to human health and the environment. In addition, as previously indicated, programs against plastic pollution that target litter have ironically led to a rise in open burning as communities participate in cleanup efforts and burn the accumulated trash.

Suggestions: The public debate has acknowledged plastic pollution as a pressing environmental issue, and there are signs that governments are facing pressure to take action. As a result, talks to draft a UN treaty against plastic pollution are underway. Any global plastics convention must explicitly identify the open burning of plastic garbage as a primary source of plastic pollution and a pressing public health issue. The open burning of plastic garbage should continue to be a primary priority despite public discourses centred on the health dangers connected with micro plastics and the endocrine-disrupting chemicals used as additives in plastics, both of which are the subject of continuing study. Community engagement initiatives to increase knowledge of the dangers involved should not be the exclusive focus of interventions aimed at stopping the open burning of mixed trash containing plastics. These initiatives need to include garbage pickers and the unorganized recycling industry in order to be more effective. Beyond current resin recycling codes, easily understandable labelling should be used to indicate the kinds of consumer plastics that are most harmful when burnt. Crucially, the plastics sector and consumer goods companies-rather than the government-should bear the responsibility of gathering and properly discarding those plastics. For short-term and high-churn applications, it is crucial to prioritize the phase-out of the manufacture of certain particularly damaging forms of plastics (e.g., polyvinyl chloride, Polyurethane, Polyethylene Terephthalate, Styrofoam). Practical solutions based on methodical study in local contexts and collaboration between national ministries of environment and the better-funded, agenda-setting ministries of health are required for the implementation of successful programs. It will also need reassessing who bears the duty for disposing of consumer plastic, moving it from communities and individual consumers to plastic producers and consumer brand owners that use plastic packaging.

Conclusion: This article has concentrated on household and community behaviours that include burning plastics outdoors in spite of rules and regulations that are in place to prevent such behaviour. Ethnographic research can shed light on the boundaries of policy-based interventions at a time when regional and global players are determined to establishing more responsibility through a global plastics convention. This is particularly true in situations where the majority of waste management is done through unofficial networks that frequently elude attempts at governance, as well as in a world where wastes-plastic and

otherwise-are being shipped in greater quantities from wealthy nations to be processed, recycled, or disposed of in low- and middle-income countries. As anthropologists of science and technology, we draw attention to the ways that legal categorization-in this case, differentiating between plastics that are appropriate or inappropriate or waste that is handled improperly-may contribute to masking the more significant issues of exponential increases in plastic production and distribution, global flows of plastic waste into underserved communities, and the limits of plastics' recyclable nature. It takes infrastructure, political will, money, and competence to oversee and implement laws and programs.

Our study has demonstrated that, in reality, governments may encounter a number of challenges when attempting to enact laws prohibiting the open burning of plastic garbage or single-use plastics. When they attempt to implement those regulations, they could also run into strong opposition from groups that include rubbish pickers and international corporations. We have proposed that some preliminary actions may be done in the name of damage reduction while significant changes toward plastic control are discussed, implemented, and evaluated. These procedures centre on acknowledging the dangers of open burning and concentrating on the plastics and packaging materials that burn with the greatest potential for harm. It is reasonable that we adopt a harm reduction approach as a first step in combating open burning. We anticipate that it will reduce the most harmful elements of the issue and increase public support and demand for more sensible plastic control laws.

References:

1. OECD. Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options. Paris: OECD Publishing; 2022. Accessed Apr. 23, 2023. DOI: <https://doi.org/10.1787/de747aef-en>
2. Charles D, Kimman L. The Plastic Waste Makers Index 2023. Minderoo Foundation, 2023. <https://cdn.minderoo.org/content/uploads/2023/02/04205527/Plastic-Waste-Makers-Index-2023.pdf>. Accessed Apr. 23, 2023.
3. Cook E, Velis C. Plastic waste exports and recycling: myths, misunderstandings and inconvenient truths. Waste Management & Research. 2022; 40: 1459-1461. DOI: <https://doi.org/10.1177/0734242X221132336>
4. European Environment Agency. The plastic waste trade in the circular economy. European Environment Agency 2019; Oct 28: briefing no. 7.
5. Matsuda T, Trang T, Goto H. The impact of China's tightening environmental regulations on international waste trade and logistics. Sustainability. 2021; 13: 987. DOI: <https://doi.org/10.3390/su13020987>
6. Pathak G, Nichter M. Ecocommunicability, citizenship, and discourses on plastic pollution in India. Geo-forum. 2021; 125: 132-139. DOI: <https://doi.org/10.1016/j.geoforum.2021.04.027>
7. Pathak G, Nichter M, Hardon A, et al. Plastic pollution and the open burning of plastic wastes. Global Environmental Change, 2023; 80: 102648. DOI: <https://doi.org/10.1016/j.gloenvcha.2023.102648>
8. Wilson DC, Rodic L, Modak P, et al. Global Waste Management Outlook. Nairobi: United Nations Environment Programme; 2015.
9. Lau WWY, Shiran Y, Bailey RM, et al. Evaluating scenarios toward zero plastic pollution. Science 2022; 369: 1455-1461. DOI: <https://doi.org/10.1126/science.aba9475>
10. Velis CA. Plastic pollution global treaty to cover waste pickers and open burning? Waste Management & Research. 2022; 40: 1-2. DOI: <https://doi.org/10.1177/0734242X211069583>
11. Christian TJ, et al. Trace gas and particle emissions from domestic and industrial biofuel use and garbage burning in central Mexico. Atmospheric Chemistry and Physics. 2010; 10: 565-584. DOI: <https://doi.org/10.5194/acp-10-565-2010>
12. Velis CA, Cook E. Mismanagement of plastic waste through open burning with emphasis on the Global South: a systematic review of risks to occupational and public health. Environmental Science & Technology. 2021; 55: 7186-7207. DOI: <https://doi.org/10.1021/acs.est.0c08536>

13. Wiedinmyer C, Yokelson RJ, Gullett BK. Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste. *Environmental Science & Technology*. 2014; 48: 9523-9530. DOI: <https://doi.org/10.1021/es502250z>
14. Verma R, Vinoda KS, Papireddy M, et al. Toxic pollutants from plastic waste—a review. *Procedia Environmental Sciences*. 2016; 35: 701-708. DOI: <https://doi.org/10.1016/j.proenv.2016.07.069>
15. IPEN Dioxin, PCBs and Waste Working Group. *After Incineration: The Toxic Ash Problem*. Prague and Manchester: IPEN; 2005.
16. Williams M, Gower R, Green J, et al. *No Time to Waste: Tackling the Plastic Pollution Crisis Before It's Too Late*. Teddington, UK and Paris, France: Tearfund, Fauna & Flora International (FFI), WasteAid & The Institute of Development Studies (IDS); 2019.
17. Ajay SV, Kiran kumar PS, Varghese A, et al. Assessment of dioxin-like POP's emissions and human exposure risk from open burning of municipal solid wastes in streets and dumpyard fire breakouts. *Exposure and Health*. 2022; 14: 763-78. DOI: <https://doi.org/10.1007/s12403-021-00450-4>
18. Fuller R, Sandilya K, Hanrahan D. *Pollution and Health Metrics*. New York, USA and Geneva, Switzerland: Global Alliance on Health and Pollution; 2019. <https://gahp.net/wp-content/uploads/2019/12/PollutionandHealthMetrics-final-12-18-2019.pdf>. Accessed April 23, 2023.
19. Sharma G, Annadate S, Sinha B. Will open waste burning become India's largest air pollution source? *Environmental Pollution*. 2022; 292: 118310. DOI: <https://doi.org/10.1016/j.envpol.2021.118310>.
20. Saikawa E, Wu Q, Zhing M, et al. Garbage burning in South Asia: how important is it to regional airquality? *Environmental Science & Technology*. 2020; 54: 9928–38. DOI: <https://doi.org/10.1021/acs.est.0c02830>.
21. Velis, C.A., Cook, E., 2021. Mismanagement of plastic waste through open burning with emphasis on the Global South: a systematic review of risks to occupational and public health. *Environ. Sci. Techol.* 55 (11), 7186-7207. <https://doi.org/10.1021/acs.est.0c08536>.
22. Sharma, K.D., Jain, S., 2020. Municipal solid waste generation, composition, and management: the global scenario. *Soc. Responsibility J.* 16 (6), 917-948. Availableat: <https://EconPapers.repec.org/RePEc:eme:srjpps:srj-06-2019-0210>
23. Gupta, S., et al., 2009. Rules and management of biomedical waste at Vivekananda Polyclinic: a case study. *Waste Manage.* 29 (2), 812-819. <https://doi.org/10.1016/j.wasman.2008.06.009>.