



# Discard Plastic Burning: A Serious Risk Factor in Dehradun, India

Santosh Kumar Karn <sup>1,\*</sup>

<sup>1</sup>Sardar Bhagwan Singh University, Balawala, Dehradun, India

\*Corresponding author: Department of Biochemistry and Biotechnology, Sardar Bhagwan Singh University, Balawala, Dehradun, India. Email: santoshkarn@gmail.com

Received 2020 June 02; Revised 2020 November 12; Accepted 2020 November 21.

## Abstract

**Background:** Dehradun, India is going to most exceedingly influencing and breaking down air quality due to the burning of the discarded plastic, where the natural beauty is the prized component. Carelessly threw the disposed of plastic and burning affecting the environment and people's health drastically. Consequently, various sicknesses and disease are the common phenomenon. Thus, this region urgently required an extensive evaluation by the governmental and non-governmental organization to solve this issue and make a strict control to stop the plastic on every day utilize premise. Their people groups endure much because of their own activity.

**Objectives:** Current study report about the environmental and public health concern due to the discard plastic burning on daily basis which causes severe respiratory disease and health hazards.

**Methods:** The current study focused on the observation and collection of plastic burning activities done by the people of on daily basis in the last three year from August 2017 to July 2020.

**Results:** As regularly as conceivable it can be found in every 20 houses there are cluster plastics burning on daily basis. Burnt Plastic, releasing lethal gases into the environment which include substances like dioxins, furans, mercury and polychlorinated biphenyls which is a hazardous compound and conceivably hurting to all kind of life. Dehradun, India is emerging as a hotspot for the broken air quality especially due to burning of discard plastic in this region and introducing smoke into the atmosphere. Due to this, numbers of affected people are increasing an everyday basis. This broken air quality is also responsible for greenhouse gases (GHG) and increasing global warming potential.

**Conclusions:** Finally, I might want to focus this area move toward becoming a hotspot to look with crumbled air quality from the last couple of years. Numbers of multiple illnesses affected peoples increasing year by year. The level of dangerous compound increasing in the atmosphere, in this way it is needful to take preparatory measure to make strict regulation and develop treatment facility to save Dehradun. As this region is like a gift by nature.

**Keywords:** Plastic Burning, Gases, Dehradun, Dioxin, Environment, Air Quality

## 1. Background

India is the country where air quality is deteriorating and going to be worst day by day in many parts. Recently public health emergency has been declared in Delhi. The air pollution of Delhi is increasing and reached up to 122  $\mu\text{g.m}^{-3}$  of PM 2.5 in Delhi. This may be due to a large number of vehicles; surrounding industries and reckless burning of biomass and waste in Delhi and also coming from nearby provinces. Tests have shown these fine pollutants are PM 2.5 includes carcinogenic chemicals such as lead, arsenic, cadmium, and mercury (1). Recently levels of PM 2.5 in Delhi reached to 710  $\mu\text{g.m}^{-3}$ , more than 11 times higher than the World Health Organization (WHO) safe limit (2). The average of PM 2.5 yearly in the current period is 150  $\mu\text{g.m}^{-3}$ , where as national standard level is 40  $\mu\text{g.m}^{-3}$  and as per WHO guideline is 10  $\mu\text{g.m}^{-3}$  and 24 hours mean is 25

$\mu\text{g.m}^{-3}$  based on WHO air quality guidelines (2,3).

About 1406 tonne of solid waste generated in Uttarakhand on everyday basis, the source of waste generation includes residential areas, commercial areas and others, but almost no processing facility available here. From the 100% generated waste no segregation and treatment facility are available, only 3% wards in Uttarakhand have facility to segregation at source. If we look Uttarakhand is one of the worst-performing state in the country in terms of processing solid waste. In overall composition analysis the plastic content is about 27.97%, Dehradun is the top-most city to contribute the highest plastic percentage in the waste. The survey stated that 327.9 tonne per day of plastic is added to the waste in the state capital which is going to increase to 584.051 tonne per day (Table 1) neighboring city like Rishikesh 240 tonne and Haridwar 236 tonnes

gradually. Overall the plastics generation in Uttarakhand is about 1500 tonne/day. Dehradun is tourist place where wellness in nature, wildlife, and religious places there naturalness must be maintained (4).

**Table 1.** Waste Plastic Generation in the Three Major Cities of Uttarakhand

Serial No.	City (Nearby Dehradun)	Waste Plastic Generation in Tonnes
1	Dehradun	327.9
2	Rishikesh	240
3	Haridwar	236

Dehradun (location 30.318°N 78.029°E), total area 300 km<sup>2</sup> is distinguished from most other districts in the state by the existence of very large forests chiefly stocked with sal. Forest products play an important role in the economy of the district. Besides, supplying fuel, fodder, bamboos and medicinal herbs, they also yield a variety of products like honey, lac, gum, resin, catechu, wax, horns and hides. The current population of Dehradun in 2020 is 919,000, a 2.68% increase from 2019. The population of Dehradun in 2018 was 871,000, a 2.7 to 2.83% increase from 2017. The main languages spoken in the district are Hindi, Sindhi, Punjabi, Garhwali and Urdu (5).

Like Delhi, there are many other cities suffering from the same situation in India especially Kolkata, Mumbai, Chennai, Hyderabad, Dehradun, etc. Open burning of garbage (such as plastic bags, bottles and packing materials apart from paper waste, clothes, etc.) at road sides, residential campuses and local markets is a common practice in Delhi. These waste materials are also dumped at landfill sites in Delhi (6). The focus of this article is on Dehradun which is known as the Doon valley where the indigenous habitat is a standout amongst the most prized components, being arranged in the lovely Doon valley. The city, which is home to typical radiance, ascending into a possessed, economically powerful and lively city. The needs of improvement and conservation of its rich indigenous habitat require being met simultaneously. Today, from Dehradun to even remote slope towns have a noodle point offering bundled nourishment, soda pops, and water in plastic containers. A great deal of this waste is indiscreetly scattered crosswise over characteristic trails and campgrounds. Next, carelessly burning, and releasing harmful chemicals into the atmosphere. Dehradun, India is going to most exceedingly influencing and breaking down air quality due to the burning of the discarded plastic, where the natural beauty is the prized component. Carelessly threw the disposed of plastic and burning throughout the year affecting the environment and people's health drastically. In this manner, various sicknesses and disease is the

common phenomenon. Thus, this region direly required a far-reaching evaluation by the administrative and non-governmental association to adapt up to this issue and make a strict control to stop the plastic on every day utilize premise. Their people groups endure much because of their own activity.

## 2. Objectives

Objective of the current study is to highlight the plastic burning activities in Dehradun, Uttarakhand, which deteriorate the air quality mostly and significantly affect the health of human and environment.

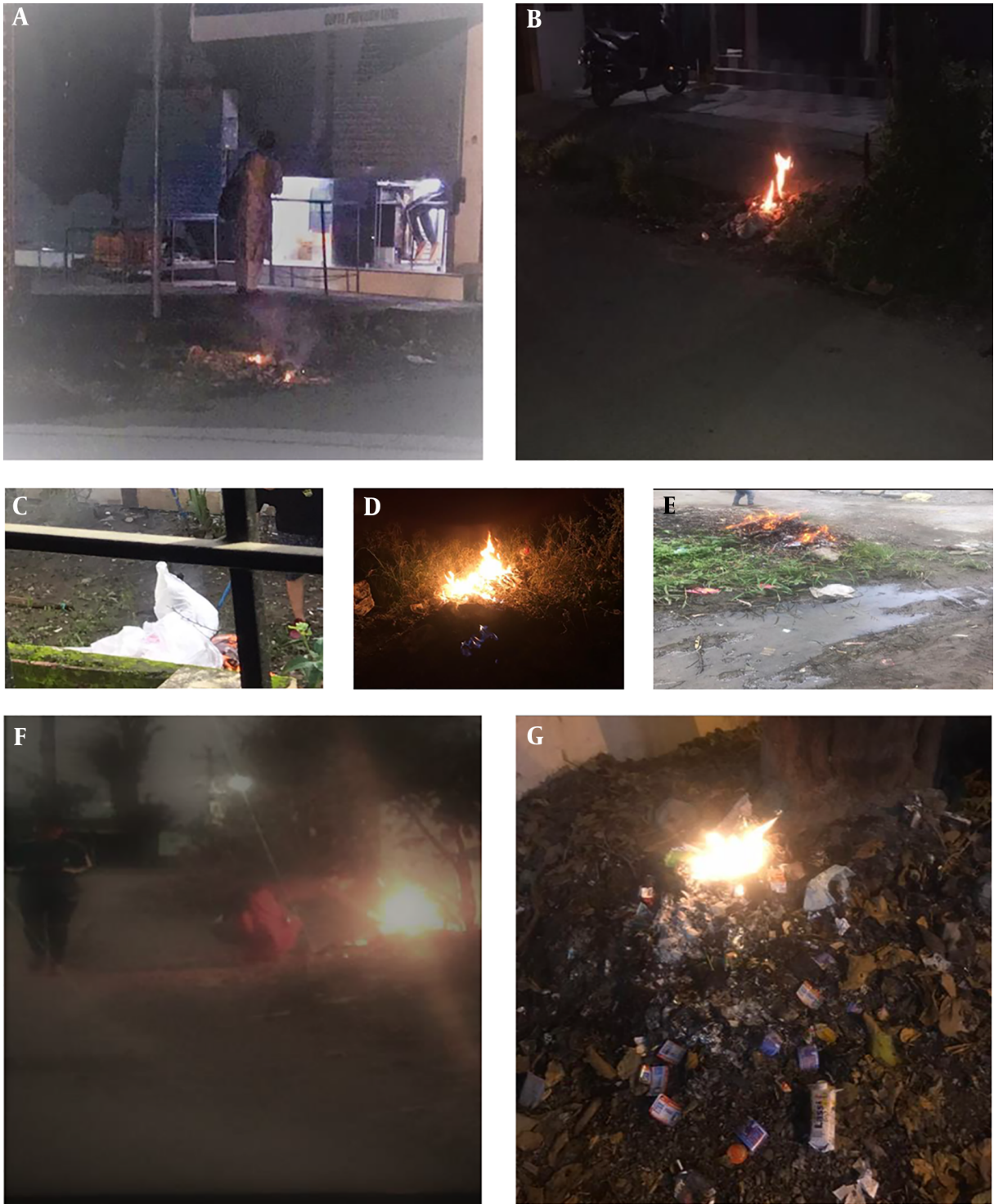
## 3. Methods

We make a common observation from August 2017 to July 2020 in Dehradun, Uttarakhand frequently plastic burn cases in every 20 houses there are bunch plastics burning on everyday basis particularly in the evening. Here people carelessly threw the discarded plastic and further collecting and burnt them. Especially in the evening, this is the common phenomena in the entire Dehradun, and it is very difficult to respire due to massive smoke. Reckless discharge practices for such waste products in this area added additional environmental burden into natural ecosystems and resulted in hazardous events, consequences (7). Even we observed that shopkeeper also collected the whole day plastics and burning it in the evening.

## 4. Results & Discussion

Emission from open burning of masses from several sources like discard plastic burning, agriculture crop residues, accidental fire, plastic film from agriculture, animal waste and residues, automobile, construction debris, crude oil and spill fire, electronic waste, landfill dump, fireworks at public celebrations etc. is of major concern to the local people, state and at national level. This releases many poisonous gases such as volatile organic carbon polycyclic aromatic hydrocarbon, carbonyl and polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofuran are released. There is no confirm emissions data and their components are available from the above mentioned sources. Open burning of plastic and emissions are spread throughout the year (Figure 1).

Burnt Plastic, releasing toxic gases into the environment which include substances like dioxins, furans, mercury and polychlorinated biphenyls which is a dangerous compounds potentially harming to all life form. It has



**Figure 1.** Different places of Dehradun; People burning the collected plastics.

expanded the danger of coronary illness; disturb respiratory diseases, for example, asthma and emphysema, and cause rashes, queasiness, or migraines, harms in the sensory system, kidney or liver, in the reproduction and development system. Dioxins settle on the crops and in our waterways where they eventually enter into our food and hence the body system. These dioxins are the lethal persistent organic pollutants and its worst component, 2,3,7,8-tetrachlorodibenzo-p-dioxin, commonly known as agentorange is a toxic compound which causes cancer and neurological damage, disrupts reproductive thyroid and respiratory systems.

A second case observed in Nainital nearby Dehradun observed Terephthalic acid in two different season and found 7 times higher in summer than that of winter aerosol in fresh plastic-waste burning aerosols, simultaneously also found potential metal As, Cd, Sb, Sn from the garbage burning, common materials in these trashes are plastic bags, bottles and packing materials apart from paper waste, clothes, etc. (7, 8). While gaseous and aerosol emissions from open burning dictate primary concern, attention should also required to soil and water contamination as a result of runoff from natural precipitation in cases of forest fires and extinguishing water in cases of accidental fires. Therefore, it is needful to develop awareness to the people by the non-governmental organization (NGO) and governmental agency and to make strict regulation, not to use plastic on daily basis. Secondly, material such as biomass, waste together with plastic waste, burning (combusted) of fossil fuel, etc. produces smoke in huge quantity. Since in real fire circumstances combustion is regularly not finish, the ash and smoke particles that are transmitted into the climate contain a significant division of unburned natural issue. Sediment is an unpredictable blend fundamentally comprising of shapeless basic carbon and sleek material. By and large, smokes with higher natural carbon substance seem darker (7, 8).

Improper waste disposal has mostly affected the terrestrial soil ecosystems, turning the useful soil systems into wastelands (9). This plastic potentially harming life causes deleterious effects on wildlife and on the aesthetic qualities of cities and forests. Plastic wastes accumulating in the environment have posed an ever-increasing ecological threat. Disposed of plastics, other than being very obvious are quickly expanding levels of strong waste in landfills, impervious to biodegradation prompting contamination, hurtful to the common habitat (10).

Plastic has become omnipresent in India, plastic has turned out to be ubiquitous in India, as indicated by the Central Pollution Control Board (CPCB) of India, add up to plastic waste which is gathered and reused in the nation is probably going to be 9,205 tonnes for every day (around

60% of aggregate plastic waste) and 6,137 tonnes stay uncollected and littered. The real guilty parties in producing such waste are four metros with Delhi contributing 689.5 tonnes every day, trailed by Chennai (429.4 tonnes), Kolkata (425.7 tonnes) and Mumbai (408.3 tonnes). This data showing the huge amount of plastics used in the Indian urban communities and cities (11).

The expanding utilization of plastic in the vicinity of 2000 and 2015, the offer of plastic bundling as an offer of worldwide bundling volumes has expanded from 17 to 25% (12). Plastic bundling volumes are relied upon to proceed with their solid development, multiplying inside 15 years and more than fourfold by 2050, to 318 million tonnes every year more than the whole plastics industry today (12). Yearly, India creates 5.6 million metric huge amounts of plastic waste with Delhi representing a stunning 689.5 metric tonnes for each day. Plastic waste has a significant portion in total municipal solid waste (MSW). MSW containing about 10 - 12% of plastic is burnt, releasing toxic gases into the environment. Landfills have contributed to nearly 20% of greenhouse gases (GHG) followed by fossil fuels. Therefore, an immediate measure to address them is the need. Plastic waste is a global problem, but with regional variability. The consuming of waste plastic material produces harmful gases representing the well-being risk by causing lung ailments and disease after inward breath (13). Vast amounts of plastics have been brought into the earth through its generation and transfer, bringing about the aggregation of plastic in biological systems over the globe. In spite of the fact that plastics get reused into bringing down esteem applications that are not again recyclable after utilize so it is a major waste and the emission of greenhouse gases so it also essential to search its effective treatment, disposal and, control which have been poorly achieved. Plastic cause's contamination and an unnatural weather change not just due to an expansion in the issue of waste transfer and landfilling, yet in addition discharge CO<sub>2</sub> and dioxins because of copying (14). Many people who consume their plastic household squander don't understand how unsafe this training is to their well-being and to nature. Therefore it urgently needs to make aware the people and stop this practice. Waste plastic can be used because it mainly consists of polymerization of ethylene, having plenty of hydrogen residues. Consequently, waste plastic having polyethylene units can be used as a hydrogen-donor hydrocarbon. Next, Conversion of plastics wastes into liquid fuel and many more (15). Further, requires more research and development to make plastic more environment-friendly to use. The increased uses of plastic products as packaging applications in recent years have increased the quantity of plastics in the solid waste stream to a great extent. (16). Discussion it is concluded



that the environmental hazards due to mismanagement of plastics. This is brief perception and remarks about the present circumstance in Dehradun from my current remain from August 2017 about the people groups and natural conditions. Their people groups languish substantially over the previously mentioned reason. This phenomenon represents a high cost to the environment and peoples of this specific area.

## 5. Conclusion

Finally, my concern about this area to increasing risk of air, water and soil pollution to peoples due to their own activities with plastic and their derivatives. Number of affected peoples increasing each year due to heavy load of pollution by plastic burning. Many people who use their plastic household waste don't understand how unsafe this preparation is to their well-being and to nature. Therefore, it urgently needs to make aware the people and stop this practice. This is brief perception and remarks about the present circumstance in Dehradun from my current stay from August 2017 to July 2020 about the people, groups and natural conditions. Their people suffer substantially over the previously mentioned reason. This phenomenon represents a high cost to the environment and peoples of this specific area.

## Acknowledgments

Authors are thankful to Dr. Gaurav Deep Singh (secretary) Sardar Bhagwan Singh University, Dehradun, India for providing facilities in the completion of the article.

## Footnotes

**Authors' Contribution:** All authors are sharing equal contributions and credits.

**Conflict of Interests:** All authors declare no conflict of interest. All authors do not have any financial or personal relationships with other people or organizations that could influence our work.

**Ethical Approval:** The ethical approval or individual consent was not applicable.

**Funding/Support:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## References

- Estrellan CR, Iino F. Toxic emissions from open burning. *Chemosphere*. 2010;**80**(3):193–207. doi: [10.1016/j.chemosphere.2010.03.057](https://doi.org/10.1016/j.chemosphere.2010.03.057). [PubMed: [20471058](https://pubmed.ncbi.nlm.nih.gov/20471058/)].
- World Health Organization; Regional Office for South-East Asia. *WNTD: India factsheet*. New Delhi, India: World Health Organization; 2018. Available from: <https://apps.who.int/iris/handle/10665/272672>.
- US Directorate of Intelligence. *Country Comparison: Population*. USA: CIA; 2021. Available from: <https://www.cia.gov/the-world-factbook/countries/india/>.
- Rawat M. *Uttarakhand generates 1,406 tonne solid waste daily, but processing is zero*. Punjab Province, India: Hindustan Times; 2018. Available from: <https://www.hindustantimes.com/dehradun/uttarakhand-generates-1-406-tonne-solid-waste-daily-but-processing-is-zero/story-47oR4P7WxHqjpVwYJvWIMJ.html>.
- National Informatics Centre: Ministry of Electronics and Information Technology Government of India. *District Dehradun*. India: District Administration Dehradun; 2021, [updated 8 Mar 2021]. Available from: <https://dehradun.nic.in/>.
- Aggarwal SG, Kumar S, Mandal P, Sarangi B, Singh K, Pokhariyal J, et al. Traceability issue in PM<sub>2.5</sub> and PM<sub>10</sub> measurements. *Mapan*. 2013;**28**(3):153–66. doi: [10.1007/s12647-013-0073-x](https://doi.org/10.1007/s12647-013-0073-x).
- Hegde P, Kawamura K. Seasonal variations of water-soluble organic carbon, dicarboxylic acids, ketocarboxylic acids, and  $\alpha$ -dicarbonyls in central himalayan aerosols. *Atmos Chem Phys*. 2012;**12**(14):6645–65. doi: [10.5194/acp-12-6645-2012](https://doi.org/10.5194/acp-12-6645-2012).
- Lofrano G, Meric S, Belgiorno V. Sustainable wastewater management in developing countries: Are constructed wetlands a feasible approach for wastewater reuse? *Int J Environ Pollut*. 2008;**33**(1):82–92. doi: [10.1504/ijep.2008.018468](https://doi.org/10.1504/ijep.2008.018468).
- Liao M, Xie XM. Effect of heavy metals on substrate utilization pattern, biomass, and activity of microbial communities in a reclaimed mining wasteland of red soil area. *Ecotoxicol Environ Saf*. 2007;**66**(2):217–23. doi: [10.1016/j.ecoenv.2005.12.013](https://doi.org/10.1016/j.ecoenv.2005.12.013). [PubMed: [16488009](https://pubmed.ncbi.nlm.nih.gov/16488009/)].
- Kumar S, Aggarwal SG, Gupta PK, Kawamura K. Investigation of the tracers for plastic-enriched waste burning aerosols. *Atmos Environ*. 2015;**108**:49–58. doi: [10.1016/j.atmosenv.2015.02.066](https://doi.org/10.1016/j.atmosenv.2015.02.066).
- Verma R, Vinoda KS, Papireddy M, Gowda ANS. Toxic pollutants from plastic waste- A review. *Procedia Environ Sci*. 2016;**35**:701–8. doi: [10.1016/j.proenv.2016.07.069](https://doi.org/10.1016/j.proenv.2016.07.069).
- Lemieux PM, Lutes CC, Santoianni DA. Emissions of organic air toxics from open burning: A comprehensive review. *Prog Energ Combust*. 2004;**30**(1):1–32. doi: [10.1016/j.pecs.2003.08.001](https://doi.org/10.1016/j.pecs.2003.08.001).
- Pramila R, Vijaya Ramesh K. Biodegradation of low density polyethylene (LDPE) by fungi isolated from municipal landfill area. *J Microbiol Biotech Res*. 2011;**1**(4):131–6.
- Ali MI, Perveen Q, Ahmad B, Javed I, Razi-Ul-Hussnain R, Andleeb S, et al. Studies on biodegradation of cellulose blended polyvinyl chloride films. *Int J Agric Biol*. 2009;**11**(5):577–80.
- Anderson LL, Ding W, Liang J. Coprocessing coal with waste plastic: Hydrogen transfer from plastic to coal by the aid of hydrogen-shuttling solvents. In: Ziegler A, Heek KH van, Klein J, Wanzl W, editors. *9th International Conference on Coal Science (ICCS '97)*. Germany: TIB – Leibniz Information Centre for Science and Technology and University Library; 1997. p. 1545–8.
- Kumar S, Gaikwad SA. Municipal solid waste management in Indian urban centres: An approach for betterment. *Urban development debates in the new millennium: Studies in revisited theories and redefined praxes*. 2. New Delhi, INDIA: Atlantic Publishers & Dist; 2004. p. 100–11.