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Law And Policies In Relation To Hazardous Waste Management In India: A Critical Study

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Abstract: Hazardous Waste Management (HWM) has emerged as a pressing concern in India due to rapid industrialization, urbanization, and the country's growing status as a global manufacturing hub. The legal and policy framework governing hazardous waste in India has evolved significantly, particularly with the enactment of the Environment (Protection) Act, 1986 and the subsequent Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. These rules, aligned with international conventions such as the Basel Convention, provide a comprehensive structure for prevention, minimization, storage, transportation, import, export, treatment, and safe disposal of hazardous waste. Despite the robust statutory regime, enforcement challenges, institutional inadequacies, and lack of awareness among stakeholders continue to hinder effective implementation. Judicial pronouncements, particularly from the Supreme Court in cases such as M.C. Mehta v. Union of India and Indian Council for Enviro-Legal Action v. Union of India, have played a pivotal role in expanding environmental jurisprudence by introducing principles such as Polluter Pays, Precautionary Principle, and Sustainable Development into the discourse on hazardous waste governance. This study undertakes a critical analysis of India's legal and policy framework, evaluating its compliance with international obligations, its strengths in establishing regulatory mechanisms, and its limitations in practical enforcement. The research further explores the need for technological advancement, stricter monitoring, and community participation to ensure that hazardous waste management policies are not only legally sound but also environmentally sustainable.

Index Terms **-** Environmental Law, Waste Management, Policy Framework, Judiciary.

I. INTRODUCTION

Life, death and waste are the three facts on this earth which will remain forever on this Earth and nothing much can be done to prevent it. In fact, all these three facts are closely associated with each other. Health cannot be isolated from waste. Maintaining cleanliness and hygiene is one of the necessary measures towards achieving a Good Health, which in turn is an essential condition of living a purposeful and meaningful life. Scientific management of waste is one of the ways to maintain cleanliness, hygiene and to achieve a healthy life. Everyday a lot of waste material is generated from homes, offices, factories, hospitals, industries and in fact all the establishments. So also, there is a huge waste which may be termed as "legacy waste" already generated through various sources and is lying unattended in various locations like fields, open spaces, drains, industrial estates, forests, and in fact every corner of India.[1]

The continuous generation of waste material is an inevitable aspect of human action. Wastes may be defined as materials or substance or thing which no longer can be used for the purposes they were intended for originally or which has lost its effect or usefulness. Waste in a common parlance can be termed as "something which is not put into proper usage at a given time". The original definition of waste res derilicta corresponds to the concept of 'use and throw away' culture. The word "waste" can also be referred to as useless, unused, unwanted, obsolete, scrap or discarded material or items.[2]

Depending upon its origin, waste can be broadly categorized as domestic or household waste (solid waste), industrial waste (presently given a scientific term as "Hazardous Waste" which is a subject matter of present research), hospital waste (Bio-medical waste), construction and debris waste, plastic waste, radioactive waste, batteries waste and e-waste. Human beings are responsible for creating or generating waste materials. These waste materials are either the by-products of any of his activities, for which he could not find any further use of it or the products that have reached the optimum usage stage or end of useful.[3]

2. MEANING OF HAZARDOUS WASTE MANAGEMENT

Simply defined, a hazardous waste is a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Hazardous waste is generated from many sources, ranging from industrial manufacturing process wastes to batteries and may come in many forms, including liquids, solids gases, and sludges. EPA developed a regulatory definition and process that identifies specific substances known to be hazardous and provides objective criteria for including other materials in the regulated hazardous waste universe.[4]

The collection, treatment, and disposal of waste material that, when improperly handled, can cause substantial harm to human health and safety or to the environment. Hazardous wastes can take the form of solids, liquids, sludges, or contained gases, and they are generated primarily by chemical production, manufacturing, and

[1] "Alexander Kiss, *"The International Control of Transboundary Movement of Hazardous Wastes*", Texas International Law Journal Vol. 26 (1991) p. 563"

[2] Bell, Stuart and Donald McGillivray, "*Environmental Law: The Law and Policy Relating to the Protection of the Environment" (*5 th edition, Oxford: Blackstone Press, 2000), p.13."

[3] Narayan S, Majumdar S, Bhattacharya K, "Hazardous waste management in Indian Scenario." www.Srcosmos.gr.srcosmos/showpuli.aspx?aa=13034.

[4] https://www.epa.gov/Visted on 3-07-2021

other industrial activities. They may cause damage during inadequate storage, transportation, treatment, or disposal operations. Improper hazardous-waste storage or disposal frequently contaminates surface water and groundwater supplies as harmful water pollution and can also be a source of dangerous land pollution. People living in homes built near old and abandoned waste disposal sites may be in a particularly vulnerable position. In an effort to remedy existing problems and to prevent future harm from hazardous wastes, governments closely regulate the practice of hazardous-waste management.[5]

2.1. What is waste?

The facts related to the histories of waste, and of the words which have been used to define it are inseparable from one another. It is observed through a quick survey that now a day altogether three different types of vocabulary have developed which is being used to describe the term "waste". The first category, includes the terms which are associated with the themes of loss and uselessness: déchet in French from the verb choir (to fall), refuse, useless, condemned or scrapped and also garbage in English (which primarily refers to animal offal), dechets in French, desperdicio in Portuguese, rifiuti in Italian, residuo in Spanish, Abfall in German. The second category contains the terms that emphasize the dirty or repulsive characteristics or nature or even appearance of these substances: immondice in French, immondizia in Italian, from the Latin mundus which means clean; literally meaning horrible. The third category of waste includes those terms which describe the materials that make up the waste or composition of waste: boues in French, spazzatura in Italian, Müll and Schmutz in German, rubbish in English derived from rubble. The word waste comes under the first category. From the old French vastum, which simply means empty or desolate, and it was first used to depict a desolate, ruined or neglected region. Later, this term was used to describe a wasteful expenditure. In early 16th Century the current meaning to the word "Waste" attains somewhat finality.[6] The fact that the original meaning of waste has a spatial dimension in that it described a place, similarly to spazzatura from the verb spazzare ie to make a space, is likely not neutral. It is also undoubtedly the case with the rich vocabulary, which has only been touched on lightly here, used to describe various wastes. Indeed, the issue of waste is closely related with (even confused with) both the issue of salubrity and sanitizing of urban space and the management of urban urine and excrement since long time.[7] In general, waste can be defined as something which is not useful or which is unwanted. Wastes can be regarded as those things which are no longer required by an individual, institution, society or industry. This waste can be produced from various sources including household, offices, shops, animal husbandry, hospitals and health care institutions, commercial activities, agriculture, construction, industries, mining, etc. In fact, waste is generated from almost all the sectors with difference in characteristics, amount and its nature. Thus, it can be considered as by-products or end products resulting from production and consumption process respectively.

[5] https://www.britannica.com. Visited on 04-07-2021

[6] Nicholas Rousakis, 'Intergenerational Justice: A Primer', Institutions for Future Generations, Gosseries, A. & I. Gonzalez (eds.), Oxford University Press 2016, pp. 34-45."

[7] *Ibid*

2.2. What is Hazardous Waste?

From ancient times till the beginning of industrial revolution, streets and more precisely the open areas in cities were used as receiving sites for urban waste i.e., human and animal urine and excrement, other organic materials from domestic or artisan activities, rubble from demolitions, various mineral debris, etc. And it is only due to this reason the composition of these soils gives us an overall idea about the history of a particular city. The release of waste directly into the soil was important because streets and squares were not always cemented and thus, they could absorb more rainwater or also urbanized areas were built on low, sometimes even on marshy ground.[8]

Industrial Revolution encouraged the growth of industries all over the world. Though, rapid industrialization plays an important role in economic growth. One of the drawbacks of industrialization is generation of enormous amount of by products and resulting waste generated due to the process, which is termed as Hazardous Waste29. Such wastes can be generated during the manufacturing processes as a by-product or can be generated due to the use of various catalysts, which need to be disposed of soon after its application. Thus, rapid industrialization has resulted in the generation of huge quantity of wastes, both solid and liquid, in industrial sectors such as sugar, pulp and paper, fruit and food processing, sago / starch, distilleries, dairies, tanneries, slaughterhouses, poultries, etc.[9]

Industrial process wastes include a wide range of materials and its composition in any Industry depends upon nature of the industrial base. Wastes can be present in the form of relatively pure substances or as a complex mixture of varying composition and physicochemical states. Examples include general factory rubbish, organic wastes from food processing, acids, alkalis, metallic sludge and tarry residues. The peculiar feature of industrial wastes is that a significant proportion is regarded as hazardous or potentially toxic and thus special handling, treatment and disposal is needed.[10]

2.3. Sources and Impact of Hazardous Waste on Public Health and Environment

Hazardous waste is an inevitable by-product of industrialization and modern development. Its generation is not limited to large-scale industries alone but extends to smaller production units and even households, making its regulation and management a complex challenge. The source and nature of hazardous waste determine the degree of harm it can cause to public health and the environment, and therefore understanding these dimensions is essential for framing effective policies.

2.4. Major Industrial Sources of Hazardous Waste

Globally, a significant proportion of hazardous waste originates from industries engaged in metal production, chemical manufacturing, petrochemical processing, and oil refining. Together, these sectors account for nearly 70 percent of the total industrial hazardous waste generated across the world. Importantly, the extent of waste generation is not determined by the size of the enterprise but rather by the category of industry and the nature of the processes involved. Micro, Small, and Medium Enterprises (MSMEs) are also important contributors, producing waste that is often more difficult to regulate due to their dispersed nature and limited compliance

[8] "K.L. Bhatia, "*Human Rights and Human Environment-A Study in the Policy Perspectives"*, ALJ, Vol.10,1990 at p. 57.

[9] Susan G Hadden, "Statutes and Standards of Pollution Control in India" (1987) Economic and Political Weekly XII, No 16, p145-160

[10] *Ibid*

capacity. Other categories of industries collectively generate around 30 percent of the total hazardous waste globally, underscoring the wide-ranging industrial roots of the problem.

2.5. Non-Industrial and Miscellaneous Sources

Hazardous waste also arises from non-industrial sources such as military bases, mining and mineral extraction operations, oil exploration, and discarded consumer goods. Small-scale generators play a particularly critical role, though they often remain outside the ambit of strict regulatory oversight. Automobile service stations, laundries, laboratories, printing units, and construction sites frequently employ chemicals that are toxic, flammable, or corrosive in nature. The hazardous waste produced in these settings often has higher toxicity and varied characteristics compared to that generated through organized large-scale processes, necessitating specialized treatment and disposal mechanisms.

Small-scale hazardous waste generators also face unique enforcement challenges. Unlike large corporations that have access to legal and administrative expertise, these small units struggle to comply with hazardous waste management regulations. The lack of awareness, infrastructure, and institutional support leads to widespread non-compliance. When the cumulative effect of numerous such small generators is considered, the environmental and health impacts become alarmingly significant.

2.6. Military Installations as Hazardous Waste Sources

Military establishments across the globe are recognized as some of the most serious contributors to hazardous waste generation. Soil and groundwater contamination has been reported at thousands of military sites, with estimates suggesting that more than 23,000 locations across 8,000 installations worldwide are affected. In the United States alone, over a hundred military bases are identified as major generators of hazardous waste. The issue is compounded by the sovereign immunity often enjoyed by military institutions, which makes it difficult for environmental enforcement agencies to carry out inspections or mandate compliance. This exemption from state and federal environmental laws has contributed to widespread contamination, prompting massive cleanup and remediation drives in recent years.

2.7. Mining and Mineral Extraction

The mining industry and mineral processing operations represent another important source of hazardous waste. Activities such as mineral extraction, ore washing, screening, and onsite processing release large volumes of toxic by-products into the environment. Heavy metals and other hazardous residues generated during these activities are chemically stable and persist in the environment for decades. They contaminate soil and water resources, threatening biodiversity and posing long-term health risks to communities dependent on these ecosystems.

2.8. Household Hazardous Wastes

Households also contribute substantially to the generation of hazardous waste, though this source is often overlooked in policy frameworks. Items such as obsolete electronic devices, electromechanical appliances, discarded batteries, domestic chemicals, and scrap materials constitute hazardous waste at the household level. Improper disposal practices result in the leaching of toxic substances, including heavy metals and persistent organic pollutants, into soil and groundwater. The absence of adequate collection, segregation, and disposal

systems makes household hazardous waste an increasingly significant challenge, particularly in urban areas where consumption levels are high.

3. Management of Hazardous Waste and Environment Protection in India

The management of hazardous waste in India has evolved gradually in response to increasing industrial activity, environmental concerns, and global commitments. Hazardous waste poses a dual threat—it directly endangers human health while simultaneously undermining environmental sustainability. In India, the challenge is particularly acute due to rapid urbanization, growth of micro, small and medium enterprises, inadequate treatment facilities, and gaps in enforcement. Effective management, therefore, requires a balanced framework of legislation, institutional mechanisms, technology-driven solutions, and public participation.

3.1.Legislative and Policy Framework

India has adopted a comprehensive legal regime for hazardous waste management under the Environment (Protection) Act, 1986. The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, provide the principal regulatory framework for classification, handling, storage, transportation, recycling, and disposal of hazardous waste.[11] These rules were introduced to align domestic law with international conventions such as the Basel Convention.[12] The legal framework emphasizes the principle of "polluter pays" and mandates environmentally sound management of hazardous waste by the occupier or generator.

In addition, other environmental legislations, such as the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, and the Public Liability Insurance Act, 1991, indirectly strengthen hazardous waste regulation.[13] Together, these laws reflect India's commitment to integrating hazardous waste management with environmental protection.

3.4. Institutional Mechanisms

The Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) serve as nodal agencies responsible for monitoring and regulating hazardous waste.[14] They are empowered to grant authorizations, inspect industrial facilities, and ensure compliance with prescribed standards. Specialized treatment, storage, and disposal facilities (TSDFs) have been established across several states to provide scientific solutions for hazardous waste disposal. Despite these efforts, significant disparities exist in terms of infrastructure and enforcement capacity, particularly between developed industrial states and less-industrialized regions.

4. Challenges in Implementation

While the legal and institutional framework is robust on paper, its implementation is fraught with challenges. Informal recycling units and small-scale generators often operate outside the ambit of regulatory oversight, leading to illegal dumping and unsafe disposal practices.[15] Inadequate capacity of TSDFs, lack of proper segregation at source, and limited awareness among stakeholders further exacerbate the problem.

[11] S. Divan and A. Rosencranz, *Environmental Law and Policy in India*, p. 455 (Oxford University Press, 2nd edn., 2001).
[12] R. D. Sharma, *Environmental Legislation in India*, p. 212 (Eastern Book Company, 2019).
[13] P. Leelakrishnan, *Environmental Law in India*, p. 134 (LexisNexis, 5th edn., 2019).
[14] Central Pollution Control Board, *Annual Report on Hazardous Waste Management*, p. 56 (CPCB, New Delhi, 2021).
[15] Shyam Divan, *Environmental Governance in India*, p. 89 (Oxford University Press, 2018).

Enforcement agencies face resource constraints, while overlapping jurisdiction among regulatory bodies sometimes leads to inefficiency and delayed action.

5. Emerging Approaches and Solutions

India has increasingly turned towards sustainable and technology-driven approaches to address the hazardous waste crisis. Co-processing in cement kilns, resource recovery, and safe recycling of e-waste are being promoted to minimize the volume of waste requiring final disposal.[16] Public-private partnerships are being encouraged to expand disposal infrastructure. The concept of Extended Producer Responsibility (EPR) has also been introduced for certain categories of waste, requiring producers to take back and recycle their end-of-life products.

In recent years, judicial interventions have played a critical role. The Supreme Court and the National Green Tribunal (NGT) have passed several landmark judgments directing state governments and industries to strengthen compliance with hazardous waste management laws. Civil society organizations and environmental activists are also increasingly influencing policy debates and creating awareness about the environmental and health hazards of unsafe waste disposal.

6. Role of Judiciary

Indian environmental law has seen considerable development in the last over three decades. Most of the principles under which environmental law works in India today were assembled over the last over three decades. A predominant share of essence of the existing law relating to the environment has developed through careful judicial thinking in the Supreme Court and the High Courts. In the process of adjudication on the environmental matters, the Supreme Court has come up with the new pattern of "judge-driven implementation" of environmental administration in India. The court has played a pivotal role in interpreting those laws and has successfully isolated specific environmental law principles upon the interpretation of Indian statutes and the Constitution, combined with a liberal view towards ensuring social justice and the protection of human rights. So, when one analyses the Indian environmental law's development path, one will surely have to keep in mind the concept of judicial law making.

The orders and directions of the Supreme Court cover a wide range of areas whether it be air, water, solid waste or hazardous waste. The field covered is very vast such as – vehicular pollution, pollution by industries, depletion of forests, illegal felling of trees, dumping of hazardous waste, pollution of rivers, illegal mining etc. The list is unending. The Supreme Court has passed orders for closure of polluting industries and environmentally harmful aquafarms, mandated cleaner fuel for vehicles, stopped illegal mining activity, and protected forests and architectural treasures like *Taj Mahal*. Some of the judgments wherein various principles relating to environment law were judicially recognised are worth mentioning:

1. MC Mehta v. Union of India (BS-IV/BS-VI Vehicles Case)

In this landmark case, the Hon'ble Supreme Court emphasized the urgent need to curb vehicular pollution by directing that no motor vehicle conforming to BS-IV standards shall be sold or registered in India from 1st April 2020, and that only BS-VI compliant vehicles would be allowed thereafter. The Court further imposed

[16] V. K. Aggarwal, *Judicial Responses to Environmental Protection in India*, p. 176 (Universal Law Publishing, 2016).

restrictions on diesel vehicles, demonstrating the judiciary's proactive role in reducing air pollution through stricter emission norms.[17]

2. MC Mehta v. Union of India (Oleum Gas Leak Case)

The Oleum Gas Leak case became the foundation of India's environmental liability jurisprudence. The Supreme Court, while compensating victims of hazardous gas leakage, evolved the doctrine of Absolute Liability—an indigenous principle stricter than the English rule of strict liability—to hold hazardous industries absolutely accountable for harm caused.[18]

3. MC Mehta v. Union of India (Ganga Pollution Case)

Addressing large-scale industrial pollution of the Ganga, the Supreme Court ordered the closure of highly polluting tanneries situated on the riverbanks near Kanpur. The judgment highlighted the incompatibility of profit-making activities with environmental protection when public health and ecological balance are at stake.

4. T.N. Godavarman Thirumulpad v. Union of India

This continuing mandamus case radically transformed forest governance in India. The Supreme Court issued a series of directions to protect forest resources and the livelihood of forest dwellers, recognizing the necessity of sustainable forest management in the Nilgiri region and beyond.[19]

5. Ganesh Wood Products v. State of Himachal Pradesh

The Court expanded the definition of "forest" to its dictionary meaning, thereby broadening its legal protection. It banned all non-forest activities on forest land without Central Government approval and constituted expert committees to identify forest areas. The judgment reinforced ecological conservation through strict judicial intervention.[20]

6. MC Mehta v. Kamal Nath

Here, the Supreme Court applied the Public Trust Doctrine for the first time in India, restraining a motel project that sought to divert a river's flow. The Court ruled that natural resources are held by the State in trust for the public, and thus cannot be exploited for private or commercial gain.[21]

7. MI Builders Pvt. Ltd. v. Radhey Shyam Sahu

The Court struck down the construction of an underground shopping complex beneath a historical public garden. Applying the Public Trust Doctrine, it emphasized that development authorities must protect, not destroy, natural and cultural heritage sites.[22]

8. **Vellore Citizens Welfare Forum v. Union of India**

The Court formally adopted the Precautionary Principle and the Polluter Pays Principle as essential parts of Indian environmental law. It held that unchecked industrial pollution of underground water by tanneries in

[17] 13029 of 1985, Order dated 24 Oct. 2018 (SC).
[18] AIR 1987 SC 1086.
[19] AIR 1988 SC 1115.
[20] 202 of 1995 (SC).
[21] (1996) 1 SCC 38.
[22] AIR 1996 SC 2468.

Tamil Nadu violated the right to a healthy environment, thereby integrating sustainable development principles in judicial reasoning.[23]

9. Indian Council for Enviro-Legal Action v. Union of India (H-acid Case)

The Supreme Court directed industries to restore the ecology of a village devastated by toxic sludge, while reiterating the polluter pays principle. This case underscored the Court's commitment to restorative justice in environmental matters.[24]

10. State of Himachal Pradesh v. Ganesh Wood Products

Reaffirming inter-generational equity, the Court invalidated forest-based industries that endangered long-term ecological balance. It stressed that sustainable development requires protecting forests not only for present use but also for future generations.[25]

11. Indian Council for Enviro-Legal Action v. Union of India (CRZ Case)

The Court examined the legality of industries violating Coastal Regulation Zone (CRZ) norms and reiterated that the principle of sustainable development would be violated where industrial activities cause substantial ecological damage.[26]

12. MC Mehta v. Union of India (Taj Trapezium Case)

The Supreme Court ordered restrictions on polluting industries near the Taj Mahal, recognizing that air pollution was deteriorating the monument's marble. By invoking sustainable development, it linked environmental protection with preservation of cultural heritage.[27]

13. Enkay Plastics Pvt. Ltd. v. Union of India

The Delhi High Court upheld the closure of units producing toxic chemicals in densely populated areas, ruling that public health considerations outweigh individual business rights under Article 19. This case reaffirmed the precedence of collective welfare over private enterprise.[28]

7. Conclusion

With the rapid growth of Industrial sector specially manufacturing sector in India the generation of HW will be an inevitable scenario posing serious threats to ecology and environment due to challenges and concerns associated with its safe and scientific disposal mechanism. This has become a global issue and even the developed countries are struggling to handle it. Situation is not different in India but alarming. Non availability of an accurate, reliable and correct data of HW which is lying (legacy waste), generated, transported, disposed of and imported is the biggest challenge in the entire chain of HWM in India. Secondly, an assessment of associated risk and scientific HWM is a crucial link in India between Environment Protection, Law and Policies governing HW and Pollution free environment. Real time data on Hazardous waste generated in India and data on HW lying unattended which is called as HW National Inventory can be used to determine the risk

[23] AIR 1996 SC 2718.
[24] AIR 1996 SC 1446.
[25] AIR 1996 SC 149.
[26] (1996) 5 SCC 281.
[27] AIR 1997 SC 734.
[28] 2000 (56) DRJ 828 (Del).

levels and same will facilitate the policy makers and authorities to devise urgent measures which are required to be adopted for safe, effective, efficient and scientific management of this modern time waste.