

HAZARDOUS WASTE MANAGEMENT AND PROTECTION OF ENVIRONMENT: NEEDS NEW IMPLEMENTATION MECHANISMS TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS



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Abstract

The earth environment tends to absorb many changes but often reacts late. Climate change and diseases are one such example. Likewise, technology and chemicals can pose significant risks to health and the environment when they are improperly or not managed, especially to the poorer communities most exposed to these negative consequences. Moreover, certain substances limit and obstruct human development, impair physical and mental development. There are many international conventions for the protection of the environment. However, due to many reasons, such as economic benefits or revenue, countries act beyond the obligations. The present study analyses conventions relating to hazardous wastes and India's implication on relevant international conventions. The current research would study the effectiveness of the legislation through the lens of Sustainable Development Goals.

Keywords

Environment, Climate Change, Hazardous Wastes, Sustainable Development Goals



1. Introduction

One of the major challenges worldwide is integrating sustainable development with growth in the economy and well-being. This can be accomplished by separating environmental damage from economic development and getting more done with fewer resources. For sustainable consumption and production patterns to be promoted and for the transition to a more environmentally friendly and socially inclusive global economy to be achieved, divergence of resources and effects is essential. To guarantee that demand and consumption are both sustainable techniques, it is necessary that it is critical to respect the earth's biophysical constraints and to keep present world consumption rates as low as possible to align them with the biological ability to offer ecological services and benefits, which is currently being exceeded. According to Resolution 1 (UNEP/EA.4/Res.1) of the United Nations Environment Programme (UNEP/EA.4/Res.1), "A circular economy" is one of the existing sustainable growth models in which materials and goods are planned to be restate, reconditioned, recycled, otherwise managed to recover and thus kept in the economic system for as long as humanly possible, including the funds from which they have been derived, and waste, highly dangerous waste, is minimized or avoided, and greenhouse emissions are avoided or minimised are avoided or minimised." The concept of circularity has significant philosophical and historical roots. The Input, or cycling in real-world systems, is a centuries-old notion with echoes in many fields' philosophical traditions. It resurfaced in industrialised nations after WWII, when investigations of non-linear systems using computers indisputably exposed the world we live in as complex, interconnected, and so unpredictable — like a metabolism rather than a mechanism. By drastically boosting digitalization, dematerialization, visibility, and feedback-driven intelligence, alpha numerical world has the capability to expedite the transformation to the above economy.

2. Hazardous Wastes

A toxic material is one that has qualities that make it potentially dangerous to human and environmental health.¹ (United States Environmental Protection Agency, 2023) Hazardous waste can take on many forms, include liquids, particles, gases, and slurries, and can come from a range of places, including industrial waste and batteries. Before a substantial to be classed as harmful waste, it must first be categorized as solid waste. As a result, assessing whether a substance identifies hazardous waste begins with the identification

¹United States Environmental Protection Agency (EPA), *The Basics of Hazardous Waste*.



of solid trash. According to the Basel Convention, 1989, Annex III,² (Unep, 2014) these elements include the following:

- Combustible Liquids/Solids
- Toxic
- Ecotoxic
- Viral Substances
- Poisonous
- Toxic
- Ecotoxic
- Disease Substances
- Incendiary

Unless they have any hazardous characteristics indicated in Annex III, wastes fall into most groups listed in Appendix I of the Basel Convention, 1989.

- Diagnostic wastes;
- Disposal of oils/water, oil and gas co-products combinations, emulsions;
- Wastes to waste from manufacturing, implementation, and use of resins, latex, phthalates, glues/adhesives;
- Wastes from surface modification of metals and plastics;
- Wastewater effluents certain substances such as copper, zinc, and lead; and
- Wastes to waste usually contains certain substances such as copper, zinc, household waste; or
- Residues resulting from household waste incineration.

3. Hazardous Wastes & Sustainable Development Goals

To understand the impacts due to increase of hazardous wastes, it is essential to understand the difference between users and customers. In a circular economy,³ (European Parliament, 2023) biological resources have been the

²Basel Convention on The Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

³ “Circular economy is a model of production and, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.” “Further, Additionally, it entails minimising waste. Recycling helps to keep a product’s components as economically viable as feasible when it reaches the end of its lifespan as a product. These can be productively applied repeatedly, adding more value. The standard, linear economic paradigm, built on a take-make-consume-throw-away cycle, is disregarded by this. This concept depends on many inexpensive, readily available energy and materials. News, European Parliament.”



only ones that can be called consumable, whereas technological materials are utilised. For example, it makes no sense to compare air conditioners and automobiles consumption to that of food. This is a small but significant distinction in how we think about materials.

Furthermore, it raises questions about the value of possessing objects in the traditional sense. What is the point of buying a drill if all you want to do is drill are there any gaps on your wall where you could put a picture? The service that a product provides is more important than the thing itself. Many technical realities of changing our industry from linear to circular are made easier by comprehending this mental transformation.

In 2015, 17 goals of the 2030 Sustainable development Agenda were endorsed by countries centred on the protection of the environment and other challenges such as gender inequality, etc. The nations are under an obligation to implement these Goals at the municipal level. Countries began to analyse their growth, development and management using the Sustainability Objectives as a lens (hereinafter referred as SDG). SDG 3 ensures healthy lives and promotes well-being for all at all ages, under which target, 3.9 deals with reducing the number of fatalities and diseases caused by chemical pollution and poisoning of the air, water, and soil. SDG 6 calls for the availability and long-term access to water and sanitation for all people and under its target, 6.3 focuses on the conservation through lowering pollutants and improving water quality contamination of water by hazardous chemicals, boosting global recycling and safe reuse.

Additionally, SDG 12, which ensures sustainable demand and consumption patterns, under its Indicator no: 12.4.1 and 12.4.2, discusses the state parties' obligation to provide information relating to international conventions on hazardous materials and substances mandated under such agreements. Therefore, as an outcome, nations are under compulsion to balance their growth and development with the protection of the environment. World nations, while considering the production of any materials that would become a hazardous waste, must consider its disposal in a cost-effective, executable method such as a circular economy to protect the environment from degradation. The Chemicals and hazardous wastes concerns were specifically elaborated under chapter 19 & 20 in Agenda Twenty-One. It identified two major issues which deals lack of sufficient information for the risk assessment and resources of assessment of chemicals for data are at hand. In Chapter twenty has five important targets prevent or limit the production hazardous wastes.



4. Why Hazardous wastes Disposal is a Global Issue?

To protect the natural resources from depletion, many countries are approaching and advancing to new technologies to handle hazardous wastes. However, when few lower economies are targeted to illegally dump the hazardous wastes, where there is a transboundary movement of these harmful wastes have become a global issue. Additionally, the countries that manage the wastes appropriately and protect the environment are also affected by the activities of neighbouring states such as mishandling or negligent in handling the hazardous waste results in damaging the environment at large. Climate change is a classic example of the above discussed issue.

In India, the judiciary has established its effective control in protecting the environment from the adverse effect caused by all wastes. In underdeveloped nations, public health priorities include infectious illnesses, malnutrition, and mortality among children. While nations develop and acquire or strengthen economic resources, it becomes more prosperous. As a result, health concerns about hazardous chemical wastes receive increasing attention. Even if a country's industry produces minimal hazardous waste, importing hazardous trash or wastes for disposal or recycling might pose health risks. Due to variances in how hazardous wastes are categorised, it's difficult to compare the release of harmful wastes produced in various nations. In most nations, open dumping is a frequently utilized method, which has a different approach to waste disposal and incinerates large amounts of hazardous wastes. Hazardous wastes which are leaked in the earth's atmosphere or environment, negatively influence humans by contaminating the air and water. In a successful hazardous waste management plan, waste reduction, recycling, and reuse should be prioritised above disposal. Low-cost systems for controlling hazardous wastes are especially needed in developing nations.⁴ (Kôji Nogawa, 1979) Few manufacturing regions around the world has experienced severe chemical contamination that has caused serious harm to the environment, human health, genetic structure, and reproductive health. Restoring these areas will require significant financial investment and the building of novel techniques.⁵ (United Nations, 2016)

⁴K. Nogawa *et al.* A Comparison of Cadmium in Rice and Renal Effects Among Jinzu River Basin Inhabitants. *Environ. Res.* (1979).

⁵ Sustainable Development, *Chemicals and Waste*. Department of Economic and Social Affairs.



5. Transboundary Movement of Hazardous Wastes

Wastes producers are constantly confronted with the challenge of how to dispose, must pick from a choice of removal and possible treatments for their wastes. It is possible, that people are increasingly deciding to export waste materials to other countries. Although it's impossible to estimate how much hazardous materials crosses state borders each year, the quantity of hazardous waste transported across state lines has in recent years, and there has been significant increase. Between 1 million to 400 million tonnes of hazardous waste per year is produced (man-made chemicals).⁶ (The World Counts, 2023) The Organisation for Economic Co-Operation and Development (OECD), a forum that works to address economic, social and environmental challenges at global level. In 2009, the OECD came out with a 'Guidance Manual for the Control of Transboundary Movements of Recoverable Wastes'. While compared to the Basel Convention, OECD framework, the aforementioned guidelines, (Council Decision C(92)39/FINAL) provides a simplified and explicit means of managing movements of wastes. The Guidance Manual further provides an understanding on its functioning and assisting national governments in its implementation.⁷ (OECD, 2009) In addition, environmental rules in industrial nations were tightened in the 1980s, resulting in considerable, if not enormous, costs of waste disposal, particularly hazardous materials disposal, that have risen. As a result, a new generation of traders emerged, offering less expensive waste disposal options.

These "toxic traffickers" transferred waste to poor countries and Eastern Europe, which lacked strict environmental standards. This carried on for a while before the entire extent of their acts became known as a result of increased media coverage that raised worldwide awareness.⁸ (Unep, 2011) This sparked international uproar, prompting international organisations to establish and implement comprehensive legal tools to control and regulate the transport of hazardous waste. With the first attempt in the establishment a comprehensive mechanism and ratification of the Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989, the world has become a safer place. There were several regional and multinational agreements negotiated in the aftermath of the Basel Convention.⁹

⁶13 tons of Hazardous Waste Produced Every Single Second. Global Challenges, The World Counts.

⁷Guidance Manual for the Control of Transboundary Movement of Recoverable Wastes.

⁸ Basel Convention

⁹Ibid



(Unep, 2011) For instance, the EU (formerly the EEC) has, issued various directives governing the trans-hazardous waste transportation across borders.¹⁰ (European Union, 2008) These directives are more tailored to the interests of EU member states to provide for more comprehensive regulation of the market. region's specific concerns. The EU directives consider the Basel Convention's requirements as well as taking use of the commission's flexibility,¹¹ (Kummer, 1995) which allows regions are free to create and implement their respective guidelines and restrictions as long like they do not conflict with the convention's provisions essential elements. Some key steps were done prior to the activities of the 1980s that would eventually prepare the way for the events of the next two decades. The Waste Management Policy Group was established by the OECD Environment Committee in 1974 to evaluate, develop, and disseminate global policy instruments to encourage waste management that are environmentally friendly. In order to contribute to long-term development. As the organisation grew since 1980, there has been a greater focus on hazardous waste, it has placed a special emphasis on transboundary (also known as trans frontier) waste movement. The Waste Management Policy Group's efforts resulted in the OECD passing the Basel Convention on Transboundary Movement and Disposal of Hazardous Wastes regulates the movement and disposal of hazardous wastes across international borders was founded on eight decisions/recommendations. Several European Directives on waste categorization, definition, and management have been enacted were also adopted as a result of the group's efforts. This is a significant accomplishment since it is critical to be able to characterise and identify hazardous trash before limiting its movement. However, there are still a lot of variances in how "hazardous waste" is defined around the world, making it impossible to compare data from different nations.

It is usual to characterise wastes transit across borders as "bad" or "undesirable." It's a contentious problem that has to be addressed, and some have even urged for its outright prohibition. Before hazardous waste transportation may be condemned, the circumstances and reasons for it must be thoroughly investigated. It should be accepted that carrying such wastes over short and long distances should be safe provided it is transported under-regulated, technically sound conditions. Suppose the waste is properly managed with the appropriate level of technology and methods and the complete system

¹⁰ Directive 2008/98/EC.

¹¹ K. Kummer Peiry, *International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules*, Oxford University Press, Oxford, 1995/99.



are well-maintained and audited regularly, then wastes should be generally safe to transport. Furthermore, suppose the waste products are adequately labelled with clearly understandable descriptions, the importing state completely possesses knowledge of the waste components and the power to grant or refuse authorization. If the host government permits it, it ought to be legal to transfer, and ethically acceptable, it has the requisite technologies, personnel, and a waste management system (including infrastructure). If the only accessible wastes facilities are in another nation, moving the hazardous waste there and using their facility may be a far more ecologically beneficial alternative than picking a less safe alternative since it is within the same state, it is one of a waste disposal technique.

Hazardous substance transportation and disposal across borders, on the other hand, raises a danger of negative consequences in all areas (land, air, water). Landfills have the potential to pollute both land and water through groundwater contamination; combustion releases pollutants into the air that would settle or be dragged down into waterbodies or onto land by rain. Every sphere that is impacted is generally affected and impacts the other spheres as well. The possible hazards of hazardous waste are increased when it is transported across borders. Longer distances travelled, for example, increase the danger of accidents during transportation or processing. The destination country's environmental regulations and regulatory procedures may be weak and complicated, resulting in increased potential negative health and environmental consequences. Any time waste is handled improperly, it poses a threat to the environment.¹² (OECD, 1997)

6. The Basel Convention's Goals & Provisions

India is a signatory to the Basel Convention, which it has signed in 1992. The Basel Convention's overall function is to keep hazardous wastes negatively influencing health and the environment. Its field of applicability Article 1 and Annex I, III, VIII and IX categorise a wide range of wastes as "hazardous wastes" based on their source, content, there are two categories of wastes, and their features categorised as "other wastes".¹³ (Kellow, 1999) The Convention's provisions are centred on the following main goals: (i) a regulatory

¹²The Organization for Economic Cooperation and Development is a global organisation that promotes economic cooperation and development (1997). Hazardous Waste Movements Across Borders: 1992–93 Statistics, 21 pp.

¹³A. Kellow, *International Toxic Risk Management: Ideals, Interests and Implementation*, Cambridge University Press, Cambridge, 1999.



regime that applies when transboundary movements are permitted; and (ii) the limitation of dangerous materials waste transboundary movements but apart from where it is interpreted to be in consistent with environmental management standards; and (iii) the decrease of hazardous waste creation and promotion of ecologically sustainable hazardous waste treatment, regardless of disposal location; and (iv) the limitation of hazardous materials transboundary movements but apart from if it is deemed to be in accordance with environmental management standards.¹⁴ (Krueger, 1999) The first purpose is met by broad regulations requiring states to follow the basic norms of environmentally sound solid waste management (Article 4). Hazardous wastes may have not been moved to Antarctica, a nation that is not a member to the Basel Convention, to meet the second purpose, or a country that has banned hazardous waste imports (Article 4). Parties, on the other hand, may reach bilateral or multilateral arrangements with the other parties or non-parties on hazardous waste management if they are “no less ecologically responsible” than the Basel Convention (Article 11).¹⁵ (Kummer, *International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules*, 1995) Where later transferred is not prohibited in theory; nonetheless, it may still take place if it is an ecologically sound choice, if environmental protection and non-discrimination principles are followed, and when carried out in conformity with the Commission’s regulatory provisions structure. As originally approved, the Basel Convention’s regulatory framework is its cornerstone. It is founded on the concept of previous and explicit consent, which stipulates that, before to any export, the exporting state’s authorities notify the officials of the possible future transfer and transiting states, provide them with any pertinent information on the planned movement The programme will be available in English be able to move forward and if and because all of the nations are on board involved have signed off on it in writing (Articles 6 & 7). The Basel Convention also allows for inter-party collaboration on a variety of issues, spanning from information sharing about the Convention’s application to technical assistance for poor nations (Articles 10 and 13).¹⁶ (Peiry, 1999)

¹⁴J. Krueger, *International Trade and the Basel Convention*, Earthscan Publications, London, 1999.

¹⁵K. Kummer Peiry, *International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules*, Oxford University Press, Oxford, 1995/99.

¹⁶K. Kummer Peiry, “The Basel Convention: Ten Years On, in: *Review of European Community and International Law*”, *Review of European Community and International Environmental Law*, vol. 7, No. 3, 1999, pp. 227-36.



As a clearinghouse, the Secretariat is responsible for facilitating and supporting this cooperation (Article 16).¹⁷ (Pallemarts, 2003) The Convention delegates to one or more of the countries concerned, and enforces the requirement to secure appropriate disposal, whether by re-importation into the originating country or elsewhere, if later transferred of waste products is conducted out unlawfully, that is, in contravention of the law of Articles six and seven, or if it cannot be completed as planned (Articles 8 and 9).

The Basel Convention, like other current global environmental agreements, has its own institutional framework. UNEP establishes Secretariat, which prepares, organises, and services sessions under the Convention, enables information sharing, and advises and assists parties on technical and legal issues. In addition, the Secretariat has a limited authority to assist parties in implementing the Convention. The Open-ended Working Group, the Expanded Bureau, and the Implementing and Compliance Committee are the Conference of the Parties' subsidiary bodies. To fulfil the needs of diverse regions and sub regions, the Convention also calls for regional or sub-regional retrain centres to be established and transfer of knowledge centres for the control the reduction of toxic waste, as well as their creation (Article 14).

The Convention aims to create regional or sub-regional training and knowledge transfer centres for the management of hazardous wastes and other wastes, as well as for reduction of their generation, to meet the needs of various regions and subregions (Article 14). As a result, fourteen of these institutions were established in regions, which conduct training and capacity-building operations.¹⁸ (Pallemarts, Toxics and Transnational Law, 2003)

7. Rules for the Management and Transboundary Movement of Hazardous and Other Wastes: India's challenges

The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 is a framework which includes other wastes such as discarded tyres, paper garbage, metal scrap, old electronic products, and so on. The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, are adequate to regulate industry because they just outline the procedures that must be followed. Apart from the guidelines mentioned earlier, only few initiatives have been taken to guarantee that the processes are followed, and because the penalties are not well-defined, the regulations are frequently disregarded or poorly implemented.

¹⁷M. Pallemarts, Toxics and Transnational Law, Hart Publishing, Oxford, 2003.

¹⁸Ibid



7.1 The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 (Amended 2022), highlight key elements

- The Regulations now expand to include urban agglomerations, statistics towns, and industrial alerts neighbourhoods, Indian Railways-controlled regions, airlines, airfields, docks and harbours, military foundations, State and federal administrations, special economic zones, and airports, airbases, ports and harbours, government organisations, pilgrimage sites, religious and historic sites, and special economic zones.
- The separation of trash at the source has been enforced to channel waste into wealth through recovery, reuse, and recycling.
- Generators are now responsible for sorting trash is separated interior hazardous wastes under three categories: wet, dry, and hazardous (biodegradable), and giving them over to approved rag-pickers, garbage collectors, or local organisations.
- Garbage dealers/kabadiwalas, waste pickers/rag pickers should be integrated into the formal system by individual states, Self Help Groups, or any other organisation created.
- No one shall toss, burn, or bury his or her solid waste on roads, open spaces outside of their homes, or in drains or water bodies.
- Generators will be responsible for paying a ‘User Fee’ to the trash collector as well as an Illegal dumping and non-segregation will result in a ‘spot fine’.
- Used menstrual waste, such as nappies and sanitary products, need to be properly wrapped in pouches provided by the makers of major brands, or in a suitable wrapping material, and disposed of in the dry waste / non-biodegradable trash container.
- In Swachh Bharat, the notion of collaboration is determined. A large quantity of Institutional providers, market groups, event planners, hotels, and restaurant have all been provided with funding direct responsibility for sorting and segregating waste, which they will handle in collaboration with local authorities.
- To ensure that biodegradable trash is used for composting/bio-methanation, all restaurants and hotels should segregate biowaste and set it up a collecting process or following the collection procedures of the local government system.



- All Resident Welfare and Market Associations, Gated Communities, and Institutions with an area must separate waste at the source, trying to separate valuable waste such as plastic, tin, glass, paper, and other materials from recyclable materials and going to hand recycled items to either authorised waste pickers or authorised recyclers, or to the urban local government.
- As much as possible, biodegradable trash decomposition or bi-methanation should be used to process, treat, and dispose of waste on-site. The residual waste must be given to the local authority's designated waste collectors or agency.
- As much as possible, biodegradable trash decomposition or bi-methanation should be used to process, treat, and dispose of waste on-site. The residual waste must be given to the local authority's designated waste collectors or agency.
- The development of biodegradable waste control and processing technologies in-house waste has been assigned to new township and Group Housing Societies.

In *Research Foundation for Science Technology v. UOI*,¹⁹ (Research Foundation for Science v. Union of India (2005) 13 SCC 186 (India), 2005) the Indian Supreme Court's involvement in recognising the safeguards as an important component of environmental sustainability and a component of customary law facilitated its implementation under The Indian Constitution's Articles 21, 48A, and 51A (g). Article 21 of the Indian Constitution states: "no individual shall be deprived of his life or personal liberty unless in accordance with the method established by law." Article 48A of the Indian Constitution requires the government to "protect and improve the environment and safeguard the country's forests and animals." 'It is the responsibility of every Indian citizen to conserve and improve the environment.' landscape, especially forest, rivers, waterways, and wildlife, and to have respect for those who live their beings,' according to Article 51A(g).

In *Vellore Citizen Welfare Forum v. UOI*,²⁰ (Vellore Citizen's Welfare Forum v. Union of India (1996) 5 SCC 647 at 658 (India)., 1996), Kuldip Singh J held in 1996 that the precautionary principle entails three conditions:

(1) The state governments and the legislative authorities must anticipate, prevent and combat the causes of environmental degradation;

¹⁹ Research Foundation for Science v. Union of India (2005) 13 SCC 186.

²⁰ Vellore Citizen's Welfare Forum v. Union of India (1996) 5 SCC 647 at 658.



(2) In case of serious threat and irreparable damage, lack of scientific certainty should not be used to justify delaying action in environmental degradation;

(3) The actor, developer, or industrialist bears the ‘onus of proof’ in demonstrating that their acts are ecologically friendly.

In *The Commissioner of Customs v. M/s City Office Equipment (2019)*,²¹ the respondent in this case involved in the importing and selling of ‘Digital Multifunctioning and Copying Machine, and second-hand photocopier machines. The Court in this case stressed upon the application of Foreign Trade Policy 2009-2014, which prescribed the procedures for importable goods. The Court held that the respondent’s goods fall under the category of goods that come under the Foreign Trade Policy and ordered the release of goods to the concern authorities. Furthermore, the National Green Tribunal (NGT) is a legislative body whose jurisdiction, powers, and procedures are governed by the National Green Tribunal Act of 2010 which establishes environmental justice. As required by Section 20, the National Green Tribunal (NGT) interprets and enforces the precautionary principle under Section 20 of the National Green Tribunal Act of 2010.²² (*The Commissioner Of Customs v. M/S.City Office Equipment, 2019*) The National Geographic Society designated the precautionary principle should be included into national environmental legislation:

*“The application of [the] protection of the environment is a statutory requirement for the Tribunal to follow when deciding or settling cases involving significant environmental issues. As a result, any infraction of this principle, even if suspected, would have been actionable in front of the Tribunal by anybody. Lack of action in the facts of this case of a given situation may constitute a violation of the law. protection of the environment, bringing the matter within the Tribunal’s jurisdiction, as specified by the NGT Act 2010”.*²³ (*Goa Foundation v. UOI, 2014*)

Uncertainty is created by cautious, incomplete, or contested scientific information relating to obliviousness, defective designs, science-based

²¹The Commissioner of Customs v. M/s City Office Equipment Writ Appeal No.1215/2019, High Court of Madras

²²‘The Tribunal shall use the sustainability principles, the carbon emitters, and the precautionary principle pays principle in making any judgement, judgement, or award,’ as stated in Section 20.

²³Goa Foundation v. Union of India (2014) 6 SCC 590.



inconsistencies, and agreeing on the amount of hazards with a low epistemological barrier of proof and an inclination for risk prevention with a low epistemological threshold of proof and a propensity toward risk prevention.²⁴ (Gill, 2017) The authority of the NGT to conduct merit reviews promotes legal principles. The NGT, as a merit court, assumes the position of principal decision-maker and is allowed to undertake in-depth investigations that encompass not only the legislation but also the advanced analytics that supports a decision.

In exercising the Tribunal must consider all components of such concerns, whether factual, technical, or legal, as part of its merit-review duty and as an expert body,' the NGT held in *M/S Sterlite Industries v. Tamil Nadu Pollution Control Board*²⁵ (M/s Sterlite Industries v. Tamil Nadu Pollution Control Board, 2013). Furthermore, the Tribunal's "merit evaluation" is not limited to the principle of *Wednesbury*. Other factors, such as a lack of proof, a lack of particular and scientific facts, or misuse of authority, may be examined by the Tribunal in deciding such a dispute. The precautionary principle has been invoked and is being observed as a normative commitment by judicial and expert personnel. Even in the lack of it, it advises the judges, particularly the technical expert judges, to offer scientifically based structural solutions and policies steps to improve and programs that, even in the absence of government intervention, creatively response to inefficient regulation.

The use of the precautionary principle is aided by the adoption of a variety of methods, such as investigative, stakeholder consultation, and the establishment of specialized committees. This enhances active participation by eliciting factual truths and expert knowledge to respond to environmental challenges through debate, argument, and conventions.²⁶ (Hanuman Laxman Aroskar v. Union of India, 2019) As a result, in India, the precautionary principle necessitates careful application in potential dangers should be monitored, prevented, and minimised. Risk factors have gotten increasingly complicated and far-reaching in recent years, with harmful health and environmental effects. The principle improves overall environmental and health decisions in India's environmental governance. Due to its irregularity (normative characteristics) and misapplication, the theory is contentious and difficult to

²⁴G.N. Gill, 'The National Green Tribunal of India: Decision-Making, Scientific Expertise and Uncertainty' (2017) 29 (2-3) *Environmental law and Management* 82-88

²⁵*M/s Sterlite Industries v. Tamil Nadu Pollution Control Board* Appl No.57/2013. NGT

²⁶*Hanuman Laxman Aroskar v. Union of India* 2019 SCC Online 441 at paras 138 and 149.



apply (legal standard of proof). There are many different definitions of the principle, making environmental issues more complicated in its governance. As indicated by case law, the responses also reflect various judicial interpretations. For example, the Supreme Court of India stated in *Research Foundation for Science Technology and Natural Resources Policy v. Union of India*,²⁷ “This principle is described as an approach to protecting the environment or human health...,” it was described as a “principle underlying environmental law” in *M C Mehta v. Union of India*²⁸ (M.C.Mehta v. UOI, 2002), and as “precautionary measures” *Golden Gas Victims of Jaipur v. UOI*.²⁹ (Jaipur Golden Gas Victims v. Union of India, 2009) As a result of the changing declarative language, the substance of the concept is muddled.

8. Circular Economy and Hazardous Waste Management: Findings & Analysis

The global issue of hazardous wastes is increasing environmental concerns and are impacting the human health, the developed nations are nailing for global cooperation to address them. Circular economy, is one sustainable solution, where countries are practicing various methods in handling the hazardous wastes. China is the first country to adopt circular economy law promoting the recovery of resources from waste (2008) and later in 2015, the European Union adopted ‘Circular Economy Package’ which included many goals relating to food, water and reuse of plastic (Report on Circular Economy: United Nations Industrial Development Organization, 2017). Likewise, to promote cleaner and efficient use of resources, in Switzerland, among 26 cantons, Zurich was the first canton to include provisions relating to circular economy, in its Constitution (2022). Though circular economy has become a solution or alternate to handle wastes, it is difficult to recycle the hazardous wastes. Circular economy would be successful in a country with strong technological foundations and development. Hazardous waste are generally Health and Environmental Consequences resources. For instance, the UN reveals that by 2022, about 1.8 billion of the world population, will live in nations and locations where there is a severe lack of water.³⁰ (Jaipur Golden Gas Victims v. UOI, 2009) Analyzing one example to know the solutions provided by the companies involved in advising on circular economy, Triumvirate

²⁷ *Research Foundation for Science Technology and Natural Resources Policy v. Union of India* 2007 AIR SCW 5851

²⁸ *M C Mehta v. Union of India* (2002) 4 SCC 356

²⁹ *Jaipur Golden Gas Victims v. Union of India* (2009) SCC W.P. (C) 6415/2006.

³⁰ *Ibid*



Environmental, a company which provides services to hazardous and non-hazardous management across North America is studied. This company explains the problems in hazardous waste management. The company has developed a recycling system called as 'closed loop system' to embrace the circular economy which involves:

- **Waste-to-Energy:** Converts high-BTU (British Thermal Unit)³¹ organic solids to steam, which may then be utilized as energy on the site. Analytical Solutions and Products B.V. defines BTU "The British thermal unit (BTU or Btu) is a unit of heat; it is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. It is also part of the United States customary units."
- **Solvent Distillation:** The recovery stills are powered by the steam generated by WTE (Waste-to-Energy). Spent solvents are re-manufactured and sold back to industry for their original solvent qualities by distillation.
- **Water Treatment:** Removes usable water from hazardous industrial wastes such as acids, bases, coolants, greasy water, and latex paint. On site, treated water is used for industrial purposes such as WTE and the cooling tower.

Further, companies may adopt circular economic concepts, keep materials in use indefinitely, and reduce the strain on natural resources by reusing these solvents. In the case of India, it is required for the government to encourage indigenous companies that is involved in the circular economy. There is lot of costs involved not only establishing the companies that handle hazardous wastes but the transport costs would be high because of special vehicles to carry the hazardous waste carefully. Therefore, it is essential for countries like India to concentrate on providing appropriate place to establish companies to handle the hazardous management. Proximity helps to reduce transport costs. Another advantage on such initiatives is that it helps companies to reduce carbon foot prints because using of excess fuel to transport hazardous waste to the companies that are far away or beyond a country's boundaries will increase the usage of fuel, time and high risk while transporting and

³¹Analytical Solutions and Products B.V. defines BTU "The British thermal unit (BTU or Btu) is a unit of heat; it is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. It is also part of the United States customary units.



would lead to other such consequences. India must encourage companies that practice cutting-edge technologies in handling hazardous wastes. Companies that create solvent waste might benefit from implementing circular economic strategies into the disposal of such wastes, which can reduce costs and carbon footprints while also lowering liability.³² (Ellen Macarthur Foundation, 2023)

To analyse the working of circular economy and its success done through an example, Ellen MacArthur Foundation increased earnings from new circular activities and decreased manufacturing costs will be used to attain this goal. These would then have a ripple effect contribute to economic growth via all areas of the economy; economic activity develops and starts building overall system health. The concept recognises the need of an efficient economy at all scales - for large and small businesses, organisations, and individuals, globally and locally.

It is founded on three guiding ideas:

- Create a waste and pollution-free environment: The negative effects of economic activities that harm human health and environmental systems are revealed and designed out in a circular economy. This includes the emissions of greenhouse gasses and hazardous chemicals, as well as contamination of the air, land, and water, as well as structural waste such as traffic congestion.
- Maintain value in terms of energy, labour, and materials: Activities that keep value in terms of energy, labour, and materials in use are favoured in a circular economy. To keep goods, components, and materials flowing in the economy, Sustainability, recycling, remanufacturing, and recycling must all be considered by designers. Circular systems promote efficient promoting the use of lab resources through a range of applications go back and forth between economic and ecological systems.
- Regenerate natural systems: A circular economy reduces non-renewable resource usage while maintaining or increasing renewable resources, such as returning key nutrients to the soil to help regeneration or relying on renewable power rather than fossil fuels.

There are various models and procedures to minimize the devastating consequences of hazardous waste. A circular economy is one of the current trends in handling hazardous wastes. The diagram below is one of the recent models to understand how the circular economy works.

³²The Circular Economy in Detail.

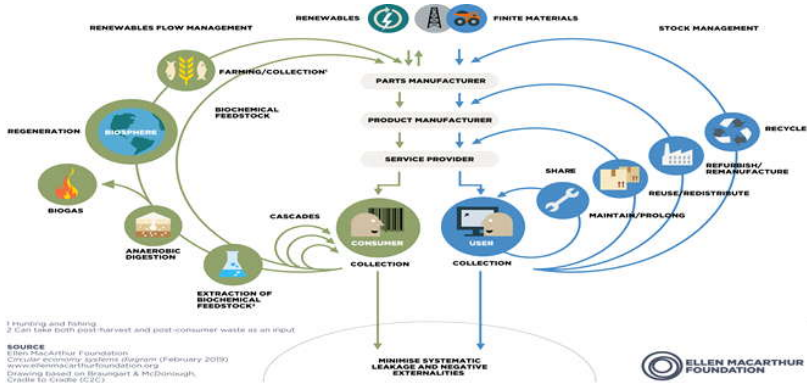


Figure – 1: Source: Ellen MacArthur Foundation (2019)

The 2023, Circularity Gap Report³³ (Fraser, 2023) provides “four key circular economy principles that we need to follow to achieve a 33% reduction in material extraction and consumption – use less, use longer, use again, and make clean. It calls for increased public-private collaboration to make this vision a reality, and points out the ultimate reason why things need to change: By upgrading to a model that maximizes the value that we extract from our precious materials, we can better ensure the well-being of present and future generations, while respecting the boundaries of our planet.”³⁴ (World Economic Forum, 2022)

Another model by the European Parliament as follows:



Figure – 2: Source: European Parliament. Published by World Economic Forum³⁵ (World Economic Forum, 2022)

³³The Circularity Gap Report, 2023.

³⁴Circular Economy.

³⁵ Ibid



Conclusion

Awareness on identification of hazardous waste is one of the challenges where people generally mishandle in disposing the hazardous wastes. Many companies responsible for producing hazardous materials have a wider challenge in handling cost-effective management when these materials turn into hazardous wastes.

Finally, Sustainable waste management allows for perfect collaborative partnerships (SDG 17) between the rich and the poor, the formally and informally sectors, communities, businesses, governments, and the international donor community. Collaboration and cooperation are perfect alternatives for sustainable trash management. Indeed, it is only through collaboration that the most rational and beneficial solutions may be discovered. As we have seen, waste generates implications across a wide range of different elements of society. Positive results are dependent on our ability to connect the links. Conclusively, the transition to recycling and reuse has the opportunity to boost the economy as well as the environment. By minimising waste, keeping commodities and commodities in use, and regenerating rather than degrading natural systems, the circular economy contributes significantly to attaining global climate goals. The idea of involving Artificial Intelligence in a product while manufacturing and utilizing raw materials will help to control the generation of harmful wastes. For instance, Artificial Intelligence- AI-assisted designers may create circular economic growth goods, components, and materials. AI can account for improved designs sooner due to how an AI system could analyse large amounts of data and offer initial thoughts or design improvements. A designer may then examine, alter, and approve changes based on the data. AI provides designers with a better understanding of the most effective designs to build and test, allowing them to maximise their time and skills. The already existing commercial strategies may not be helpful for the industries and producers to achieve the SDG unless they understand 'innovation is a key to progress' - need to be applied to circular economy models. Conclusively, the world nations have agreed many policies and SDGs are one such kind of obligation accepted by the nations which must be enforced and complied at every stage of growth and development. Achieving the Sustainable Development Goals is not merely an understanding among the nations, but are goals that are developing a governance that balances development and environmental protection.