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**Chemicals and hazardous waste management:** international norms and their implementation in India

**Gestão de Produtos Químicos e Resíduos Perigosos:**

Normas Internacionais e sua Implementação na Índia

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# **Chemicals and hazardous waste management: international norms and their implementation in India\***

## **Gestão de Produtos Químicos e Resíduos Perigosos: Normas Internacionais e sua Implementação na Índia**

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### **Abstract**

The objective of this paper is to analyse the status of Chemicals and Hazardous waste management in India. Chemicals and hazardous wastes generated in the current industrialised world cause serious damage to human health and the environment. India is a party to five international instruments, namely the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, the Stockholm Convention on Persistent Organic Pollutants, the Minamata Convention on Mercury, and the Strategic Approach to International Chemicals Management (SAICM), to protect the environment from the evil effects of chemicals and hazardous wastes. Financial and technological constraints, lack of awareness, the attitude of indifference of industrial units, the developmental needs of the country, and inadequate enforcement mechanisms have severely affected Indian compliance status vis-a-vis international norms. Evaluating the present scenario, especially to unearth the problems faced in grassroots-level implementation and to address them adequately, is indispensable to prevent the looming catastrophe. We have discussed the five international instruments and India's obligations as a member state in the first part of the paper followed by the status of chemicals and hazardous management in the country by analysing the national inventory of hazardous wastes from 2016-2022. In the final segment, we have summarised our findings and provided our independent opinion on measures that may be taken for the sound management of chemical and hazardous wastes in the country.

**Keywords:** hazardous wastes; hazardous waste management; chemicals; environment; human health.

### **Resumo**

O objetivo deste artigo é analisar a situação da gestão de produtos químicos e resíduos perigosos na Índia. Os produtos químicos e resíduos perigosos

gerados no mundo industrializado contemporâneo causam sérios danos à saúde humana e ao meio ambiente. Para mitigar esses impactos, a Índia é signatária de cinco instrumentos internacionais, a saber: a Convenção de Basileia sobre o Controle de Movimentos Transfronteiriços de Resíduos Perigosos e seu Depósito; a Convenção de Roterdã sobre o Procedimento de Consentimento Prévio Informado para Certos Produtos Químicos e Pesticidas Perigosos no Comércio Internacional; a Convenção de Estocolmo sobre Poluentes Orgânicos Persistentes; a Convenção de Minamata sobre Mercúrio; e a Abordagem Estratégica para a Gestão Internacional de Produtos Químicos (SAICM). Esses instrumentos visam proteger o meio ambiente dos efeitos nocivos decorrentes do uso e descarte de substâncias químicas e resíduos perigosos. Contudo, a implementação eficaz dessas normativas na Índia enfrenta desafios significativos. Restrições financeiras e tecnológicas, a falta de conscientização, a atitude de indiferença de algumas unidades industriais, as demandas do desenvolvimento nacional e a insuficiência dos mecanismos de fiscalização afetam gravemente o cumprimento das normas internacionais pelo país. A avaliação do cenário atual, sobretudo para identificar as dificuldades enfrentadas na implementação em nível local e propor soluções eficazes, é essencial para prevenir uma possível catástrofe ambiental e sanitária. No primeiro segmento deste estudo, discutimos os cinco instrumentos internacionais e as obrigações da Índia como Estado-membro. Em seguida, analisamos a situação da gestão de produtos químicos e resíduos perigosos no país, com base no inventário nacional de resíduos perigosos de 2016 a 2022. Na parte final, sintetizamos nossas conclusões e apresentamos uma análise independente com recomendações para a gestão adequada dessas substâncias na Índia.

**Palavras-chave:** resíduos perigosos; gestão de resíduos perigosos; produtos químicos; meio ambiente; saúde humana

## 1 Introduction

The earth is susceptible to ruinous and irreversible environmental changes that pose serious threats to the ecosystem and human life it supports. These changes are outcomes of human activities that have thoughtlessly exploited the planet and its resources until it beca-

me evident that these environmental changes are detrimental to human life and that further deterioration would threaten their very existence. According to studies conducted over the years, scientists have identified certain planetary boundaries that are indispensable for maintaining the environmental balance. Fearfully, six of the nine identified boundaries have already been transgressed by 2023.<sup>1</sup> Despite the global efforts to restore the lost balance, the outcome is dismal, raising doubts about the sufficiency of policies, their implementation, and the sustainability of human activities at the international as well as national levels.

The thresholds of production of novel entities<sup>2</sup> have been quantified in the 2023 report by the Stockholm Resilience Centre<sup>3</sup> and it is way beyond the safe boundaries. The pace at which new chemicals and other novel entities are being produced and released into the ecosystem is alarming. Presently, we can find at least 3,50,000 varieties of manufactured chemicals in the world markets which include plastics, industrial and other chemicals, and pharmaceuticals including antibiotics.<sup>4</sup> These novel entities developed by mankind over the years in humungous volumes have transgressed the planetary boundaries making it very difficult for governments across the world to manage them, assess the potential risks, and control the environmental damage.<sup>5</sup> The production and use of these novel entities lead to the generation of chemical wastes which has been a matter of concern for years. Scaling down the quantity of waste generated, employing effective reuse and recycling methods, and proper management and disposal of waste are necessary to protect the environment. Multilateral action and efficient implementation of environmental

<sup>1</sup> PLANETARY Boundaries. [2024?]. Available at: <https://www.stockholmresilience.org/research/planetary-boundaries.html>. Accessed on: 11 May 2024.

<sup>2</sup> 'Novel entities' means "new substances, new forms of existing substances and modified life forms", including "chemicals and other new types of engineered materials or organisms not previously known to the Earth system as well as naturally occurring elements (for example, heavy metals) mobilized by anthropogenic activities". See PERSSON, Linn *et al.* Outside the safe operating space of the planetary boundary for novel entities. *Environmental Science & Technology*, [s. l.], v. 56, p. 1510 – 21, 2022.

<sup>3</sup> RICHARDSON, J. *et al.* *Azote for Stockholm Resilience Centre*. Estocolmo: Stockholm Resilience Centre, 2023.

<sup>4</sup> PLANETARY Boundaries. [2024?]. Available at: <https://www.stockholmresilience.org/research/planetary-boundaries.html>. Accessed on: 11 May 2024.

<sup>5</sup> PLANETARY Boundaries. [2024?]. Available at: <https://www.stockholmresilience.org/research/planetary-boundaries.html>. Accessed on: 11 May 2024.

programs are essential for managing the novel entities, analyzing the potential risks, taking remediation actions for the environmental damage caused, and for effectively managing and disposing of the hazardous wastes generated from their production and use.

The Indian chemical industry is magnanimous and around 80,000 varieties of chemicals are available in the markets.<sup>6</sup> India ranks sixth among the world's largest chemical-producing countries and is the fourth-largest producer of chemicals in Asia.<sup>7</sup> India contributes around 2.5 percent of the total sale of chemicals worldwide and the market is projected to reach US\$ 304 billion by 2025.<sup>8</sup> It is the second-largest producer as well as the third-largest consumer of chemical fertilizers.<sup>9</sup> Around 16% of the world's dyestuff and dye intermediaries are produced in India.<sup>10</sup> India is world's eleventh-largest exporter of chemicals and the exports have increased about 106 times from 2013-14 to 2021-22.<sup>11</sup> India exports chemicals to more than 175 coun-

tries across the world,<sup>12</sup> which makes it a hub for the manufacture of chemicals. In the process, it also generates large quantities of hazardous wastes. The number of hazardous waste generating units has increased over the years and although India has a comprehensive legal framework for the storage, management, and disposal of hazardous wastes, there are noticeable gaps in the implementation.

In the first part of the paper, we have discussed the five international instruments to which India has been a signatory and India's obligations as a member nation towards safe and scientific management of chemicals and hazardous wastes. These instruments have played a vital role in designing the domestic legal framework and policies across countries, including India and act as guiding factors for paving the way forward in an environmentally sustainable manner. In the latter part of the paper, we have presented the current status of the management of chemicals and hazardous wastes in India and analyzed the gaps in implementation and the scope for ameliorating the deficiencies.

## 2 International Instruments

### 2.1 The Basel Convention

The Basel Convention is one of the first significant global instruments that gathered the focus of nations toward the sound management and disposal of hazardous wastes. The lack of a global document governing the cross-national exchange of hazardous wastes and the increasing concern over the effective means of managing and disposing of such wastes, especially by developing countries paved the way for the adoption of the Convention.<sup>13</sup> The Cairo Guidelines, the precursor to the Basel Convention, was a set of guidelines and principles for assisting the Governments in developing policies for management of hazardous wastes in an en-

<sup>6</sup> KAPOOR, Amit; NEGI, Subhanshi. *India's booming chemical and petrochemical industry: understanding industry landscape*. Gurugram: Institute of Competitiveness; Ministry of Chemicals And Fertilizers, 2022. Available at: [https://chemicals.gov.in/sites/default/files/inline-files/Report\\_Understanding\\_Industry\\_Landscape.pdf](https://chemicals.gov.in/sites/default/files/inline-files/Report_Understanding_Industry_Landscape.pdf). Accessed on: 13 June 2024.

<sup>7</sup> KAPOOR, Amit; NEGI, Subhanshi. *India's booming chemical and petrochemical industry: understanding industry landscape*. Gurugram: Institute of Competitiveness; Ministry of Chemicals And Fertilizers, 2022. Available at: [https://chemicals.gov.in/sites/default/files/inline-files/Report\\_Understanding\\_Industry\\_Landscape.pdf](https://chemicals.gov.in/sites/default/files/inline-files/Report_Understanding_Industry_Landscape.pdf). Accessed on: 13 June 2024.

<sup>8</sup> KAPOOR, Amit; NEGI, Subhanshi. *India's booming chemical and petrochemical industry: understanding industry landscape*. Gurugram: Institute of Competitiveness; Ministry of Chemicals And Fertilizers, 2022. Available at: [https://chemicals.gov.in/sites/default/files/inline-files/Report\\_Understanding\\_Industry\\_Landscape.pdf](https://chemicals.gov.in/sites/default/files/inline-files/Report_Understanding_Industry_Landscape.pdf). Accessed on: 13 June 2024.

<sup>9</sup> INDIA. Ministry of Chemicals And Fertilizers. Department of Fertilizers. *Fortieth report demand for grants 23-24, Standing Committee on Chemicals and Fertilizers 2022-23*. 2023. Available at: [https://loksabhadocs.nic.in/lssccommittee/Chemicals%20&%20Fertilizers/17\\_Chemicals\\_And\\_Fertilizers\\_40.pdf](https://loksabhadocs.nic.in/lssccommittee/Chemicals%20&%20Fertilizers/17_Chemicals_And_Fertilizers_40.pdf). Accessed on: 13 June 2024.

<sup>10</sup> KAPOOR, Amit; NEGI, Subhanshi. *India's booming chemical and petrochemical industry: understanding industry landscape*. Gurugram: Institute of Competitiveness; Ministry of Chemicals And Fertilizers, 2022. Available at: [https://chemicals.gov.in/sites/default/files/inline-files/Report\\_Understanding\\_Industry\\_Landscape.pdf](https://chemicals.gov.in/sites/default/files/inline-files/Report_Understanding_Industry_Landscape.pdf). Accessed on: 13 June 2024.

<sup>11</sup> KAPOOR, Amit; NEGI, Subhanshi. *India's booming chemical and petrochemical industry: understanding industry landscape*. Gurugram: Institute of Competitiveness; Ministry of Chemicals And Fertilizers, 2022. Available at: [https://chemicals.gov.in/sites/default/files/inline-files/Report\\_Understanding\\_Industry\\_Landscape.pdf](https://chemicals.gov.in/sites/default/files/inline-files/Report_Understanding_Industry_Landscape.pdf). Accessed on: 13 June 2024.

<sup>12</sup> INDIA. Ministry of Commerce and Industry. *Chemical industry and export in India*. 2014. Available at: <https://www.indiantradeportal.in/vs.jsp?lang=0&id=0,31,24100,24105>. Accessed on: 13 June 2024.

<sup>13</sup> VALIN, D. The Basel Convention on the control of transboundary waste and their disposal: should the United States ratify the accord. *Indiana International & Comparative Law Review*, [s. l.], 6, n.1, p. 267-288, 1995.

vironmentally safe manner.<sup>14</sup> These guidelines covered the management of hazardous wastes from the source of their generation to their ultimate disposal with special emphasis on the transboundary exchange of the wastes.<sup>15</sup> The United Nations Environment Programme (UNEP) Governing Council created a working group to facilitate the incorporation of the Cairo Guidelines into a Convention to make it binding on the parties to it under international law. The Khian Sea and the Koko incidents added much-needed impetus to the negotiations, and thereafter, in March 1989, the Basel Convention was formulated by representatives from 116 countries<sup>16</sup> and it finally came into force on 5 May 1992. “Wastes” are defined as substances or objects that are disposed of, are intended to be disposed of or required to be disposed of.<sup>17</sup> It was brought into effect to address the risk of environmental degradation and damage caused to mankind by the transportation of hazardous and other wastes, especially to the developing countries, which faced capability constraints in managing such wastes.<sup>18</sup> Annexure III of the Convention enlists characteristics that are used to classify a substance as hazardous under the Convention. A waste is considered hazardous if it is explosive, corrosive, oxidizing, flammable, poisonous, infectious, or toxic<sup>19</sup> and due to such characteristics, it

might have severe and irreparable impacts on human health and the environment, if not disposed of systematically and scientifically.<sup>20</sup>

The Convention does not put an overall ban on the movement of hazardous wastes across nations per se, but it emphasizes that it is necessary to acknowledge and protect the sovereign rights of every country to restrict the disposal of foreign hazardous wastes in their territory where such wastes pose serious risks to public health and the environment.<sup>21</sup> It focuses on the efficient management and sound disposal of hazardous wastes by the countries by putting the ultimate responsibility on the exporter of the waste.<sup>22</sup> The significance of the proper exchange of information is recognized as one of the most important factors in the process of transboundary exchange of wastes. The prior information exchange during the transboundary exchange of chemical wastes shall be the guiding factor for countries to accept or restrict the import of hazardous wastes into their territories.<sup>23</sup> For the realization of its objectives, the Convention stresses on the creation and application of low-waste technologies, recycling of wastes to minimize the quantum of hazardous wastes generated, and establishment of sound waste management and disposal systems by the parties to the Convention.<sup>24</sup>

Following the general obligations as mentioned under Article 4 of the Convention, the parties are required to make efforts for reducing the generation of hazardous and other wastes in its territory and set up adequate facilities for the disposal of such wastes in a sound manner. The member states also have the duty to control and minimize the cross-border movement of

<sup>14</sup> INFORMEA. *Decision 14/30 of the Governing Council of UNEP, Cairo guidelines and principles for the environmentally sound management of hazardous wastes*. 1987. Available at: <https://www.informea.org/sites/default/files/imported-documents/UNEP-CHW-COMP-GUID-CairoESMofHazardousWaste1987.English.pdf>. Accessed on: 11 May 2024.

<sup>15</sup> INFORMEA. *Decision 14/30 of the Governing Council of UNEP, Cairo guidelines and principles for the environmentally sound management of hazardous wastes*. 1987. Available at: <https://www.informea.org/sites/default/files/imported-documents/UNEP-CHW-COMP-GUID-CairoESMofHazardousWaste1987.English.pdf>. Accessed on: 11 May 2024.

<sup>16</sup> VU, Hao-Nhien Q. The Law of Treaties and the Export of Hazardous Wastes. *UCLA Journal of Environmental Law And Policy*, [s.l.], v. 12, n. 2, p. 389 – 434, 1994.

<sup>17</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

<sup>18</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

<sup>19</sup> Annex III, BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

<sup>20</sup> WOLTERS, Claire. Toxic waste, explained. *National Geographic*, 2019. Available at: <https://www.nationalgeographic.com/environment/global-warming/toxic-waste/>. Accessed on: 11 May 2024.

<sup>21</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

<sup>22</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

<sup>23</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

<sup>24</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.



hazardous wastes such that that will safeguard human beings and the environment. It shall be the exporter's responsibility not to export hazardous waste to any country which has restricted the import of such waste or to any developing country, which it has reason to believe is not competent to handle the waste in an environmentally friendly manner.

Under the Convention, the transnational movement of hazardous wastes is permitted only under three circumstances: firstly, where the exporting country lacks the capacity to dispose of the waste in an environmentally sound manner; secondly, where the wastes serve as raw materials for recycling and recovery industries and lastly, where the parties to the transboundary movement of the hazardous wastes have agreed upon some criteria which do not defeat the broader objectives of the Convention.<sup>25</sup> The Convention is in its complete spirit against any illegal traffic of hazardous wastes and points out any such illegal movement as criminal.<sup>26</sup> It emphasizes on the effective dissemination of information to control illegal dumping of hazardous wastes.<sup>27</sup> Along with the information procedure, it also states the requirement of a movement document which is to be accompanied by the waste from the place of commencement of the transboundary exchange to the place of its disposal.<sup>28</sup> The exporting state shall prohibit the generator or exporter from initiating the transboundary movement until it obtains a written consent from the importing state.<sup>29</sup> The packaging, labelling, and trans-

portation of hazardous wastes are to be done strictly adhering to the generally accepted and recognized international rules and international practices.<sup>30</sup> The member states are under the obligation to take all such measures under their national jurisdiction to restrict every person from transporting or disposing of hazardous wastes in the absence of valid authorization to do so.<sup>31</sup>

The Ban Amendment is considered to be a significant milestone in the life years of the Basel Convention. It was adopted in 1995 during the third meeting of the Conference of Parties (COP). The amendment prohibits the transboundary movement of hazardous chemical wastes from OECD to non-OECD nations.<sup>32</sup> However, it is highly debated as even though the ban might be effective in combating the menace of dumping wastes in developing countries, it is also argued that it might disincentivize fair trade and the development of sound waste recycling methods.<sup>33</sup>

At present, 187 countries are parties to the Basel Convention. It acts as an umbrella for all other conventions adopted for the sound management of hazardous wastes and has contributed significantly towards the development of technical guidelines for facilitating the sound management of wastes by various Governments and all stakeholders. With synergies created through the adoption and enforcement of the Rotterdam and Stockholm conventions, the Basel Convention is in a position to consider the wastes in a manner that promotes the management of wastes throughout their complete life cycle.<sup>34</sup>

<sup>25</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024. Art. 4.

<sup>26</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024. Art. 9.

<sup>27</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024. Art. 4.

<sup>28</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024. Art. 4.

<sup>29</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024.

Art. 4.

<sup>30</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024. Art. 4.

<sup>31</sup> BASEL Convention on the control of transboundary movements of hazardous wastes and their disposal. Basel, 1992. Available at: <https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>. Accessed on: 13 June 2024. Art. 4.

<sup>32</sup> MILESTONES. 2024. Available at: <http://www.basel.int/TheConvention/Overview/Milestones/tabid/2270/Default.aspx>. Accessed on: 13 June 2024.

<sup>33</sup> POPE, Elizabeth S. The shadowy world of hazardous waste disposal: why the Basel Convention's structure undermines its substance. *S. C. Journal of International Law and Business*, [s. l.], v. 13, n. 2, p. 305 – 338, 2017.

<sup>34</sup> MILESTONES. 2024. Available at: <http://www.basel.int/TheConvention/Overview/Milestones/tabid/2270/Default.aspx>. Accessed on: 13 June 2024.

## 2.2 The Rotterdam Convention

Considering the growing concern over the potential risks posed by the increasing production and transboundary exchange of hazardous pesticides and chemicals, the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization of the United Nations (FAO), jointly took initiatives leading to the development and promotion of voluntary information exchange programmes during the middle of 1980s.<sup>35</sup> The most vulnerable and exposed to the perils of the production and trade of such hazardous chemicals were the developing countries which did not have proper infrastructure or ability to monitor the import and use of chemicals. To mitigate these concerns, the FAO launched the International Code of Conduct on Distribution and Use of Pesticides in 1985 and the London Guidelines for the Exchange of Information on Chemicals in International Trade was set up by the UNEP in 1987.<sup>36</sup> In 1989, both the organizations jointly implemented the Prior Informed Consent Procedure for proper dissemination of information so that the governments could make an informed decision on chemical imports after carefully assessing the hazards attached to it. However, the organizations soon felt that the prior informed consent procedure lacked mandatory control mechanisms which led to the formulation of the Prior Informed Consent Procedure for Certain Hazardous Chemicals in International Trade in March 1988 after the 1992 Rio Summit. The Convention was adopted on 10 September 1998 in Rotterdam and entered into force on 24 February 2004.<sup>37</sup>

The Rotterdam Convention is one of the most important instruments that aims to curb and mitigate the baleful effects caused by the process of exchange of hazardous chemicals and pesticides through international trade between the nations. Presently, there are 161

parties to the Rotterdam Convention.<sup>38</sup> The prior informed consent (PIC) and Information Exchange form the cornerstone of this Convention. The list of chemicals subject to the PIC procedure has been provided under Annex III of the Convention. The PIC procedure formalizes a mechanism for obtaining and circulating the decisions of the importing states signifying their assent to receive future shipments of chemicals that are listed in Annex III or otherwise. To ensure informed decision-making by the states, a decision guidance document is prepared for every chemical that is listed in Annex III, and circulated to all member states for assessing the risks associated with the handling and disposal of the chemical. The Convention also promotes information exchange among the member states for a wide range of chemicals that are potentially hazardous under Article 14. Under Article 12, each member state is duty-bound to notify every regulatory action taken by them for banning or placing severe restrictions on chemicals. Any country intending to export a banned or severely restricted chemical from its territory should issue a notification to every importing party prior to the first shipment and yearly thereafter. Article 13 states that any transboundary exchange of banned or severely restricted chemicals should be accompanied by essential health and safety information and a safety data sheet.

Articles 5, 6, and 7 of the Convention contain provisions for listing banned or severely restricted chemicals and severely hazardous pesticide formulations under Annex II and for bringing them under the ambit of the PIC procedure. One of the central aims of the Convention is to promote the sound management of chemicals in all countries. It gives special recognition to the requirements of countries in the developing stage in this regard and emphasizes technology transfer along with transfer of finances and technical assistance to them to strengthen their capabilities and capacities for achieving the goals of the Convention.<sup>39</sup> The Convention has been implemented to achieve sustainable development which cannot be a reality if trade and environ-

<sup>35</sup> HISTORY of negotiations of the Rotterdam Convention. 2024. Available at: <http://www.pic.int/TheConvention/Overview/History/Overview/tabid/1360/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>36</sup> HISTORY of negotiations of the Rotterdam Convention. 2024. Available at: <http://www.pic.int/TheConvention/Overview/History/Overview/tabid/1360/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>37</sup> HISTORY of negotiations of the Rotterdam Convention. 2024. Available at: <http://www.pic.int/TheConvention/Overview/History/Overview/tabid/1360/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>38</sup> See STATUS of ratifications. 2024. Available at: <http://www.pic.int/Countries/Statusofratifications/tabid/1072/language/en-US/Default.aspx>. Accessed on: 13 June 2024.

<sup>39</sup> ROTTERDAM Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade. Rotterdam, 2004. Available at: <https://www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.aspx>. Accessed on: 13 June 2024.

ment are not mutually supportive and in consonance with each other.

The Convention gives due regard to the health of consumers and workers along with general public health and the environment and is a principal instrument for protecting the same from the harmful impacts of internationally traded hazardous chemicals and pesticides. It encourages shared responsibility and mutual cooperation among member states for holistically achieving the desired objectives.<sup>40</sup> The Convention applies explicitly to chemicals that are banned, severely restricted or are severely hazardous.<sup>41</sup>

For ensuring adherence to the objectives of the convention and their successful implementation, the parties are required to take all necessary measures. Strengthening of national institutions and infrastructure plays a pivotal role in sound industrial practices, and thus, the parties should amend or adopt their legislative and administrative measures in a manner that leads to the realization of the objectives of the Convention in the most effective manner.<sup>42</sup> It is to be ensured by the parties that the public has adequate avenues to procure information on handling of chemicals, accident management, and safer alternatives for the production of their products.<sup>43</sup>

Bridging information gaps and guiding all stakeholders to make an informed decision is undoubtedly beneficial for preventing/regulating illegal dumping and exchange of hazardous wastes. By getting prior information, especially the developing countries will be in a better position to make decisions regarding future shipments of hazardous chemicals by analyzing the risks at-

tached with the handling and disposal of the chemicals and weighing them with the infrastructure, technology, and finances available for their sound management at their disposal.

### 2.3 Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention is based on the precautionary principle and was adopted to protect human health and the environment from the dangers of persistent organic pollutants (POPs).<sup>44</sup> POPs are organic chemical substances, which, owing to their physical and chemical properties, remain intact in the environment once released into it and are toxic to both human beings and wildlife.<sup>45</sup> They have the inherent ability to spread widely throughout the environment as an outcome of various natural processes that involve soil, water, and air and accumulate in fatty tissues of living organisms, including human beings.<sup>46</sup> This process is called bioaccumulation.<sup>47</sup> Some of the most serious effects of POPs include cancer, hypersensitivity, allergies, and damage to the nervous system, the reproductive system, and the immune system.<sup>48</sup> One of the most serious concerns over the contamination of the environment caused by POPs is that they can travel all across the globe thousands of kilometers away from the POP source and that they can be easily transmitted to the offspring of the living organisms that are affected by POPs.

Considering the ruinous impacts of POPs, the Governing Council of UNEP made a request for developing an international process for assessing a list of 12 POPs which are known as the Dirty Dozen,<sup>49</sup> and

<sup>40</sup> ROTTERDAM Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade. Rotterdam, 2004. Available at: <https://www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.asp>. Accessed on: 13 June 2024. Art. 1.

<sup>41</sup> ROTTERDAM Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade. Rotterdam, 2004. Available at: <https://www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.asp>. Accessed on: 13 June 2024. Art. 3.

<sup>42</sup> ROTTERDAM Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade. Rotterdam, 2004. Available at: <https://www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.asp>. Accessed on: 13 June 2024. Art. 4.

<sup>43</sup> ROTTERDAM Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade. Rotterdam, 2004. Available at: <https://www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.asp>. Accessed on: 13 June 2024. Art. 15.

<sup>44</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024.

<sup>45</sup> WHAT are POPs?. Switzerland, 2024. Available at: <http://chm.pops.int/TheConvention/ThePOPs/tabid/673/Default.aspx>. Accessed on: 11 May 2024.

<sup>46</sup> MORTIMER, M.; REICHEL-T-BRUSHEIT, A. *Marine pollution- monitoring, management and mitigation*: persistent organic pollutants (POPs). Berlin: Springer, 2023. p.187.

<sup>47</sup> MORTIMER, M.; REICHEL-T-BRUSHEIT, A. *Marine pollution- monitoring, management and mitigation*: persistent organic pollutants (POPs). Berlin: Springer, 2023. p.187.

<sup>48</sup> WHAT are POPs?. Switzerland, 2024. Available at: <http://chm.pops.int/TheConvention/ThePOPs/tabid/673/Default.aspx>. Accessed on: 11 May 2024.

<sup>49</sup> POPs and pesticides. 2022. Available at: <http://www.toxicslink.org/?q=content/pops-and-pesticides>. Accessed on: 13 June 2024.

sought recommendations from the International Forum on Chemical Safety (IFCS) on international action in this matter in May 1995.<sup>50</sup> In June 1996, the IFCS recommended a legally binding instrument of a global character for minimizing the risks from the 12 POPs for reducing or eliminating their emissions and discharges into the environment.<sup>51</sup> Pursuant to this and through constant efforts made in this regard, the Stockholm Convention was adopted in 2001 at Stockholm, which came into force on 17 May 2004. Currently, 184 countries are parties to it.

The Stockholm Convention places the responsibility on the manufacturers of Persistent Organic Pollutants to take steps to reduce the harmful impacts of POPs and to provide adequate information to users, governments, and the public to make them aware of the hazardous nature and properties of chemicals. It emphasizes that the contribution made by the private or non-governmental sector is indispensable in reducing and eliminating emissions and discharges of POPs. The Convention requires all parties to prohibit and stop the production, use imports, and exports of POPs mentioned in Annex A.<sup>52</sup> The Convention allows for the registration of specific exemptions by the member nations which enables them to produce and use certain POPs for which alternatives are not readily available, however, the transboundary exchange of these chemicals can take place only under specific restrictive conditions as provided under the Convention. Annex B to the Convention permits the parties to register for the production and use of the listed POPs for acceptable purposes. The member nations are required to take all measures to promote the use of the best environmental practices and techniques to control the emissions and discharge of POPs into the environment.<sup>53</sup> Each party

should ensure that chemicals listed in Annexes A and B are imported only to be disposed of in an environmentally safe manner or for the purpose for which the party has acquired permission in adherence with the PIC Procedure.<sup>54</sup>

The Parties to the Convention should make maximum efforts to minimize or stop the emissions and discharges from the unintentionally produced POPs and ensure that any stockpiles or waste that contains POPs or is believed to be contaminated with them are managed and disposed of safely in an environmentally sound manner.<sup>55</sup> Stockpiles of chemicals listed in Annex A or B, which are not usable as per the specific exceptions or acceptable purposes provided and are prohibited from being exported according to the provisions of this Convention, shall be treated as wastes.<sup>56</sup> These wastes should be handled, collected, transported, stored, and disposed of most effectively.<sup>57</sup>

The cross-border movement of wastes containing POPs should be carried on in conformity with the relevant rules, standards, and guidelines applicable to such movement. The Convention creates provisions for a Persistent Organic Pollutants Review Committee comprising experts in the assessment and management of chemicals. It has been established for the examination of proposals for the listing of chemicals by the parties under the Convention in an integrative and balanced manner following the provisions of Article 8 of the Convention.

The ninth meeting of the Conference of the Parties (COP) to the Stockholm Convention was conducted from 29 April to 10 May 2019 at the Geneva International Conference Centre (CICG), Geneva, Switzerland. The central theme of the meeting was “Clean Planet,

<sup>50</sup> HISTORY of negotiations of the Rotterdam Convention. 2024. Available at: <http://www.pic.int/TheConvention/Overview/History/Overview/tabid/1360/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>51</sup> HISTORY of negotiations of the Rotterdam Convention. 2024. Available at: <http://www.pic.int/TheConvention/Overview/History/Overview/tabid/1360/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>52</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024. Art. 3.

<sup>53</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024. Art. 5.

<sup>54</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024. Art. 3.

<sup>55</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024. Art. 8.

<sup>56</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024. Art. 8.

<sup>57</sup> STOCKHOLM Convention on Persistent Organic Pollutants. Stockholm, 2004. Available at: <http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>. Accessed on: 11 May 2024. Art. 8.



Healthy People: Sound Management of Chemicals and Waste”.<sup>58</sup> The meeting concluded with the listing of two chemicals, namely dicofol and perfluorooctanoic acid (PFOA), its salts, and related compounds in Annex A.<sup>59</sup> Amendments were made in Annex B which details out the acceptable purposes and specific exemptions for perfluorooctanesulfonic acid (PFOS), its salts, and perfluorooctanesulfonyl fluoride.<sup>60</sup> The most significant outcomes included reviewing the progress made in getting rid of polychlorinated biphenyls (PCBs), adopting terms of reference for determining the amount of funding required for the Convention’s effective implementation between 2022 and 2026, adopting the updated framework for evaluating its efficacy, and endorsing the Novosibirsk Institute of Organic Chemistry in Novosibirsk, Russian Federation, as a regional centre for the Stockholm Convention.<sup>61</sup>

## 2.4 The Minamata Convention on Mercury

Mercury, owing to its ability to persist in the environment, once it is anthropogenically introduced through accumulation and to cause significant harmful impacts on human health and the environment, has made itself a chemical of global concern. Mercury contamination can negatively impact the neurological development of the foetus, cause lower fertility, and affect the brain, neurological system, cardiovascular system, kidneys, and skin.<sup>62</sup> The UNEP started a global assessment of

mercury and its compounds in 2001, which evidenced the need to take further actions to address the lethal impacts of mercury and its compounds on human health and the global environment.<sup>63</sup> The UNEP Governing Council finally agreed in 2009 that there was a requirement for an international treaty to take effective steps for the minimizing of the amount of harmful mercury in the environment. The Minamata Convention was adopted by delegates representing over 140 countries on 19 January 2013. It came into force in 2017, and till April 2018, 91 countries have joined the Convention.<sup>64</sup> The Minamata Convention is named after the city of Minamata situated in Japan, which experienced the ugliest case of mercury contamination after industrial wastewater containing methyl-mercury was discharged into the Minamata Bay from a chemical factory. The poisoning and adverse effects continued for decades killing wildlife, destroying food chains, taking the lives of innumerable inhabitants, and leaving others severely disabled. The lesson that we learned from the experiences of Minamata Bay is that Mercury does not just damage individual victims; it has the potential to damage entire communities.<sup>65</sup>

The Minamata Convention provides an innovative and comprehensive approach relating to mercury and its compounds throughout their lifecycle that commences from its mining and continues till the disposal of mercury and mercury-bearing wastes. It is founded on the principles laid down under the Basel, Rotterdam, and Stockholm conventions, and all these conventions taken together, form a cyclopedic international framework for the most effective and sound management of chemicals and wastes that are hazardous. The global transport of mercury demands global action, which is impossible to achieve in the absence of a multilateral global document. The primary vision of the Convention is to safeguard the environment and public health against anthropogenic emissions of mercury and

<sup>58</sup> REPORT of the Conference of the Parties to the Stockholm Convention on persistent organic pollutants on the work of its night meeting. 2019. Available at: <http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP9/tabid/7521/Default.aspx>. Accessed on: 11 May 2024.

<sup>59</sup> REPORT of the Conference of the Parties to the Stockholm Convention on persistent organic pollutants on the work of its night meeting. 2019. Available at: <http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP9/tabid/7521/Default.aspx>. Accessed on: 11 May 2024.

<sup>60</sup> REPORT of the Conference of the Parties to the Stockholm Convention on persistent organic pollutants on the work of its night meeting. 2019. Available at: <http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP9/tabid/7521/Default.aspx>. Accessed on: 11 May 2024.

<sup>61</sup> REPORT of the Conference of the Parties to the Stockholm Convention on persistent organic pollutants on the work of its night meeting. 2019. Available at: <http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP9/tabid/7521/Default.aspx>. Accessed on: 11 May 2024.

<sup>62</sup> MERCURY: environmental implications and toxicity. *Parivesh Bhawan*, [s. l.], p. 37-42, 2009. Available at: [https://cpb.nic.in/uploads/News\\_Letter\\_Mercury\\_2017.pdf](https://cpb.nic.in/uploads/News_Letter_Mercury_2017.pdf). Accessed on: 13 June 2024.

<sup>63</sup> MERCURY: environmental implications and toxicity. *Parivesh Bhawan*, [s. l.], p. 37-42, 2009. Available at: [https://cpb.nic.in/uploads/News\\_Letter\\_Mercury\\_2017.pdf](https://cpb.nic.in/uploads/News_Letter_Mercury_2017.pdf). Accessed on: 13 June 2024.

<sup>64</sup> HISTORY of negotiations of the Rotterdam Convention. 2024. Available at: <http://www.pic.int/TheConvention/Overview/History/Overview/tabid/1360/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>65</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024.

its compounds.<sup>66</sup> It mandates that the parties regulate mercury emissions by reducing and eliminating the use of mercury and its discharge from small-scale gold mining,<sup>67</sup> control mercury emissions,<sup>68</sup> and gradually eliminate or reduce the use and release of mercury in certain products<sup>69</sup> and manufacturing processes<sup>70</sup> as provided under the Convention. It bans new mercury mines.<sup>71</sup> The member nations are required to take suitable steps to manage and dispose of mercury wastes in consonance with the Basel Convention.<sup>72</sup> Another vital aspect dealt with under this Convention is the identification, assessment, prioritization, management, and remediation of sites contaminated by mercury and mercury compounds in an environmentally sound manner by the Parties.<sup>73</sup> The Convention contains comprehensive provisions for technical<sup>74</sup> and financial assistance,<sup>75</sup>

information exchange,<sup>76</sup> public awareness,<sup>77</sup> research, and monitoring<sup>78</sup> providing a complete framework for meeting its objectives of protecting humankind and the environment from the claws of mercury pollution.

## 2.5 The SAICM

The Strategic Approach to International Conference on Chemicals Management (SAICM) is a global policy framework envisioned to enhance chemical safety at the global level.<sup>79</sup> It was adopted on 6 February 2006 with the primary goal of attaining responsible chemical management throughout their lifecycle so that, by 2020, chemicals are produced and used in a way that minimizes their significant negative effects on the environment and human health.<sup>80</sup> The SAICM comprises of the Dubai Declaration on International Chemicals Management and an Overreaching Policy Strategy, and the broad objectives of the document are organized under five themes, namely, risk reduction; knowledge and information; governance; capacity-building and technical cooperation; and illegal international traffic.<sup>81</sup> Managing chemicals responsibly has been considered indispensable for sustainable development, poverty eradication and reduction and elimination of diseases, improvement of human health, protection of the environment, and overall development in the standard of living of people.<sup>82</sup> The SAICM works towards bridging

<sup>66</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 1.

<sup>67</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 7.

<sup>68</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 8.

<sup>69</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 3.

<sup>70</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 5.

<sup>71</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 3.

<sup>72</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 11.

<sup>73</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 12.

<sup>74</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 14.

<sup>75</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 13.

<sup>76</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 17.

<sup>77</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 18.

<sup>78</sup> UNITED NATIONS. *Minamata Convention on Mercury*. Minamata, 2017. Available at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>. Accessed on: 11 May 2024. Art. 19.

<sup>79</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>80</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>81</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>82</sup> UNITED NATIONS. *Overview, strategic approach to international*

the existing gaps in the capacities to achieve sustainable chemical management systems suitable for both developed and developing countries.<sup>83</sup> The SAICM covers not only the environmental aspects of chemical safety within its ambit but also stresses the economic, social, health, and labour aspects.<sup>84</sup> It extends to agricultural and industrial chemicals and intends to cover them throughout their lifecycle, including in products.<sup>85</sup> The Dubai Declaration and the Overreaching Policy Strategy are accompanied by a Global Plan of Action<sup>86</sup>, which acts as a guiding document for the stakeholders to realize the objectives of the SAICM.<sup>87</sup>

### 3 The Indian Position

India became a signatory to the Basel Convention and ratified it on 5 May 1992, and subsequently, signed the Rotterdam Convention in 2005, the Stockholm Convention in 2006, the Minamata Convention in 2014, and the SAICM in 2006. However, studies have shown that the chemical and hazardous waste management system in the country is still far away from being satisfactory.<sup>88</sup> Developing countries like India are still struggling and lagging as compared to developed countries in protecting the environment and lives of people from the devastating and chronic effects of hazardous chemicals

and wastes.<sup>89</sup> Even after three decades after the adoption of the Basel Convention, it is approximated that over 90% of waste is still produced and traded from the industrial nations.<sup>90</sup> Growth of international trade has also been a major factor behind the developing countries being easy targets for dumping hazardous wastes from developed countries as the zeal for having access to foreign markets has made the developing countries compromise their environmental standards during trade negotiations.<sup>91</sup> Added to this, the PIC procedure under the Basel Convention presupposes the ability of the nations to assess the probable risks for making an informed decision regarding the import of hazardous wastes, which is lacking in a developing country like India.<sup>92</sup> Hence, the PIC procedure does not work effectively to regulate the movement of chemicals and hazardous wastes from developed to developing countries.

The Rotterdam Convention, if effectively implemented, will be a boon for developing countries to overcome the problem of trade in hazardous chemicals and substances but like all other conventions, it requires domestic regulations and enforcement mechanisms for the realisation of its goals. Unfortunately, India lacks such an effective regulatory mechanism, and thereby, many chemicals, though banned in the host countries, find a way to India in the process of exportation.<sup>93</sup> Economic benefits are also often prioritised over health and environmental damage in the zeal to increase market access to Indian products.<sup>94</sup> Added to these concerns,

*chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>83</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>84</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>85</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>86</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>87</sup> PERREZ, Franz Xavier. The strategic approach to international chemicals management: lost opportunity or foundation for a brave new world. *Review of European Comparative and International Environmental Law*, [s. l.], v. 15, n. 3, p. 245 – 257, 2006.

<sup>88</sup> KARTHIKEYAN, Leelavathy *et al.*, The management of hazardous solid waste in India: an overview. *MDPI, Environments*, [s. l.], v. 5, n. 9, 2018.

<sup>89</sup> UNITED NATIONS. *Overview, strategic approach to international chemicals management*. [202-?]. Available at: <http://www.saicm.org/About/SAICMOverview/tabid/5522/language/en-US/Default.aspx>. Accessed on: 11 May 2024.

<sup>90</sup> AJIBO, Kenneth I. Transboundary hazardous wastes and environmental justice: implications for economically developing countries. *Environmental Law Review*, [s. l.], v. 18, n. 4, p. 267 – 283, 2016.

<sup>91</sup> AJIBO, Kenneth I. Transboundary hazardous wastes and environmental justice: implications for economically developing countries. *Environmental Law Review*, [s. l.], v. 18, n. 4, p. 267 – 283, 2016.

<sup>92</sup> AJIBO, Kenneth I. Transboundary hazardous wastes and environmental justice: implications for economically developing countries. *Environmental Law Review*, [s. l.], v. 18, n. 4, p. 267 – 283, 2016.

<sup>93</sup> ZAHEDI, Nancy S. Implementing the Rotterdam Convention: the challenges of transforming aspirational goals into effective controls on hazardous pesticide exports to developing countries. *Geo. International Environmental Law Review*, [s. l.], v. 11, n. 3, p. 707 – 740, 1999.

<sup>94</sup> ZAHEDI, Nancy S. Implementing the Rotterdam Convention: the challenges of transforming aspirational goals into effective controls on hazardous pesticide exports to developing countries. *Geo. International Environmental Law Review*, [s. l.], v. 11, n. 3, p. 707 – 740, 1999. p. 710.



industrial lobbying is yet another serious concern regarding the listing of chemicals under Annex III of the Rotterdam Convention to ban or severely restrict them.<sup>95</sup> This was one of the major reasons for the opposition to the listing of Chrysotile asbestos by India despite the known adverse impacts of the substance on human health and the environment.<sup>96</sup>

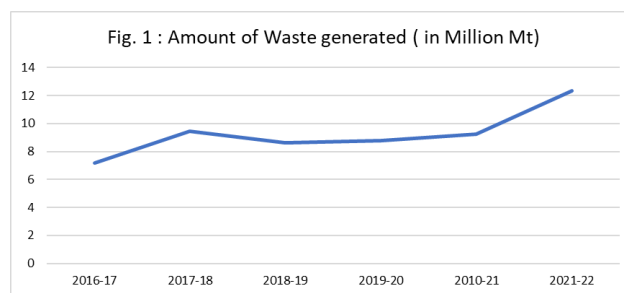
Indian track record in terms of handling POPs and mercury is also not good, despite being party to the above-mentioned international instruments. Although India is the second largest contributor to global mercury pollution, there is no single consolidated regulation for managing a specific pollutant like mercury.<sup>97</sup> Its regulatory setups and implementation of action plans for managing mercury and POPs are grossly inadequate with no dedicated management strategy and inadequate monitoring by the authorities.<sup>98</sup> Lack of awareness, information exchange, financial and technological constraints, under-enforcement of existing laws, and flaws in governance hinder the implementation of the above-mentioned international instruments in India.<sup>99</sup> Hence, it is the need of the hour to probe into the current situation in India to unearth the practical difficulties faced in different parts of India while implementing international obligations in handling chemicals and hazardous wastes to find a durable solution.

### 3.1 Generation of Hazardous Wastes in India

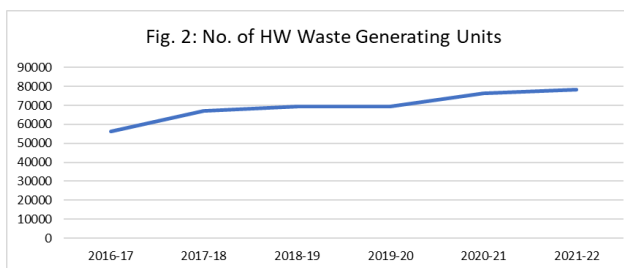
India generated 12.35 million Metric Tonnes of hazardous wastes in 2021-22, which is approximately 25% more than the year before it. The graph below in Fig.1 shows the steady increase in the quantum of waste ge-

nerated in the country from 2016 to 2022. The increase can be attributed to either the increase in the number of hazardous waste-generating industries or due to higher reporting of the same. In certain districts of almost half of the states in the country, the quantity of waste generated transgresses the authorized limit.<sup>100</sup> As evident from the graph in Fig. 2, the number of hazardous waste-generating industrial units has also increased over the past years. There is almost a 30% increase in the number of industrial units generating hazardous wastes from 2016-22. Several states have reported to manage more quantity of hazardous wastes than their quantity available for them for management.<sup>101</sup> Gujarat generates 28.30% of hazardous wastes which is the highest in the country. Gujarat, Maharashtra, Tamil Nadu, Odisha, Andhra Pradesh, Rajasthan, Jharkhand, Uttar Pradesh, Telangana and Kerala cumulatively generate about 88% of the total hazardous waste generated in India.

Graphic 1



Graphic 2



<sup>95</sup> BASU, Soma. India reverses stand on asbestos at Rotterdam Convention Meet. *DownToEarth*, [s. l.], May 2013. Available at: <https://www.downtoearth.org.in/news/india-reverses-stand-on-asbestos-at-rotterdam-convention-meet-40990>. Accessed on: 11 May 2024.

<sup>96</sup> BASU, Soma. India reverses stand on asbestos at Rotterdam Convention Meet. *DownToEarth*, [s. l.], May 2013. Available at: <https://www.downtoearth.org.in/news/india-reverses-stand-on-asbestos-at-rotterdam-convention-meet-40990>. Accessed on: 11 May 2024.

<sup>97</sup> SHARMA, B. M. *et al.* Implementation of the Minamata convention to manage mercury pollution in India: challenges and opportunities. *Environ. Sci. Eur.*, [s. l.], v. 31, n. 4, p. 10, 2019.

<sup>98</sup> SHARMA, B. M. *et al.* Implementation of the Minamata convention to manage mercury pollution in India: challenges and opportunities. *Environ. Sci. Eur.*, [s. l.], v. 31, n. 4, p. 10, 2019.

<sup>99</sup> SHARMA, B. M. *et al.* Implementation of the Minamata convention to manage mercury pollution in India: challenges and opportunities. *Environ. Sci. Eur.*, [s. l.], v. 31, n. 4, p. 10, 2019.

<sup>100</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2019-20*. 2021. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_Inventory2019-20.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_Inventory2019-20.pdf). Accessed on: 13 June 2024.

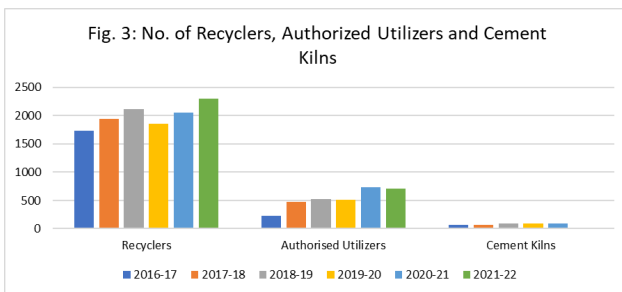
<sup>101</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2021-22*. 2023. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_Inventory2021-22.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_Inventory2021-22.pdf). Accessed on: 13 June 2024.



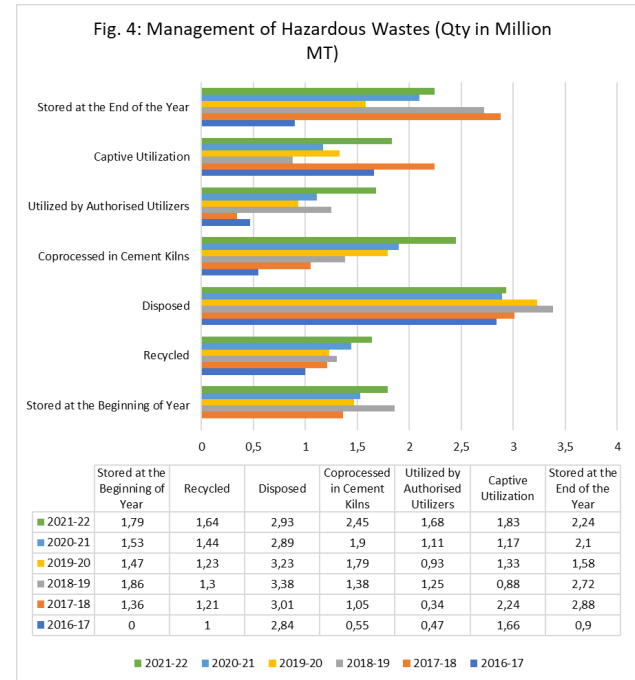
### 3.2 Management of Hazardous Waste in India

The hazardous wastes generated from the industries are stored on the premises before they are recycled, disposed of, utilized by authorized dealers, or co-processed in cement kilns. In almost all the years ranging from 2016-22, interstate movement of hazardous waste has been recorded but there are inconsistencies in the data about the quantity involved. On the positive side, India has recorded an increase in the number of recyclers and the quantum of waste that is recycled. Most of the recyclers are located in Maharashtra, Haryana, Gujarat, and Uttar Pradesh. There has also been a rise in the number of authorized users and cement kilns where hazardous wastes can be utilized. They are majorly located in the states of Gujarat, Maharashtra and Uttar Pradesh. Resultantly, despite the increase in the quantity of hazardous waste generated, the quantity that is residual for disposal has not increased. However, it is observed that a significant quantity of hazardous wastes continues to be stored in the industrial units at the end of the year.

**Graphic 3**



**Graphic 4**



### 3.3 Availability of TSDFs

Presently, 50 Treatment, Storage and Disposal Facilities (TSDFs) are available across India. Some of these facilities are integrated but others are either commonly secured landfills or incinerators alone. The number of TSDFs has risen from 42 to 50 and the number of integrated facilities has risen from 18 to 20 from 2016 to 2022. Apart from these, there are 141 captive facilities.

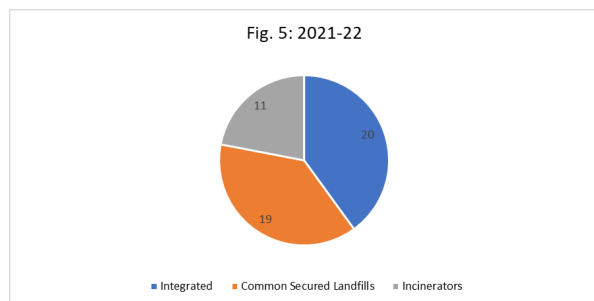
10 states namely, Assam, Bihar Chandigarh, Delhi, Manipur, Meghalaya, Mizoram, Nagaland, Puducherry and Sikkim have neither common nor captive facilities for disposal of hazardous waste. Bihar, Chandigarh, Delhi, Puducherry and Sikkim transport their hazardous wastes to other states for disposal in common secured landfill facility and incinerators.<sup>102</sup> Despite having TSDF, some of the states such as Madhya Pradesh, Rajasthan, and Tamil Nadu transport their wastes to other states for disposal although their capacity is underutilized.<sup>103</sup>

<sup>102</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2021-22*. 2023. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_Inventory2021-22.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_Inventory2021-22.pdf). Accessed on: 13 June 2024.

<sup>103</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2020-21*. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2020-21.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2020-21.pdf). Accessed on: 13 June 2024.

Strikingly, the infrastructure for handling, management, and disposal of hazardous domestic waste is almost non-existent. As per the Solid Waste Management Rules 2016, domestic hazardous wastes such as paint drums, pesticide cans, CFL bulbs, tubelights, expired medicines, broken mercury thermometers, used batteries, needles and syringes, contaminated gauges, etc, are required to be safely collected by deposition centres and transported for safe disposal. However, only Tamil Nadu has one centre for collecting such waste and has received around 131 MT of waste in 2018-19 which was sent for disposal to the common TSDF.<sup>104</sup> Fluorescent and mercury-containing lamps are regulated under E-Waste Management Rules 2016, and are required to be channelized through common TSDF if no specialized recycling facility is available. At present, only six states namely, Kerala, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh and West Bengal have collection centres for domestic wastes such as fluorescent and mercury-containing lamps, which raises concerns regarding the handling, management, and disposal of such wastes in other states.<sup>105</sup> Out of the 17 collection centres in the country, 12 are located in Maharashtra.<sup>106</sup>

**Graphic 5**



cessed on: 13 June 2024.

<sup>104</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2019-20*. 2021. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_Inventory2019-20.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_Inventory2019-20.pdf). Accessed on: 13 June 2024.

<sup>105</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2020-21*. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2020-21.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2020-21.pdf). Accessed on: 13 June 2024.

<sup>106</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2019-20*. 2021. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_Inventory2019-20.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_Inventory2019-20.pdf). Accessed on: 13 June 2024.

**Table**

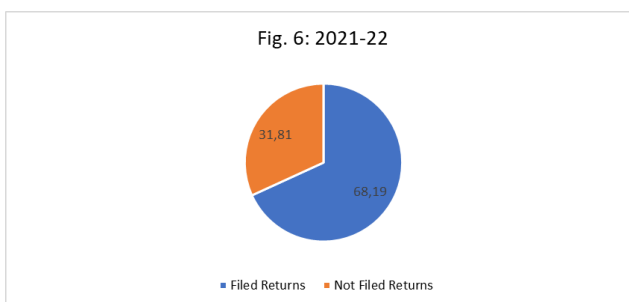
**1**

Treatment and Disposal (collected from annual inventory of hazardous wastes)						
	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17
No. of TSDF	50	45	45	45	42	42
Integrated	20	18	17	17	18	18
Common Secured Landfills	19	16	16	16	14	14
Incinerators	11	11	12	12	10	10
No. of States with no TSDF	10	11	11	11	11	11
No. of Captive Facilities	141	136	136	131	112	NA

### 3.4 Gaps in Reporting

In spite of an operative legal framework and efforts by the implementors, more than 30% of hazardous waste generating and handling units do not submit annual returns to the State Pollution Control Boards. The number of industries filing returns has steadily risen over the last few years but the situation still remains dismal.

**Graphic 6**



**Table 2**

Year	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17
No. of HW Generating Industries	78437	76235	69308	69416	66914	56350

Year	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17
Percentage of Industries Filing Returns	68.19	63.96	67	54.18	Data NA	Data NA

In the annual reports submitted by the hazardous waste generating and handling units, recyclers, and utilizers, there are disparities in the information provided by them.<sup>107</sup> There are inconsistencies, especially in the quantum of hazardous wastes that are recycled, utilized, transported to another state, disposed of, and stored at the beginning or end of the year.<sup>108</sup>

The State Pollution Control Boards are required to file annual inventories with the Central Pollution Control Board. Around 16% of the states have not filed their inventories in 2021-22. There are mismatches and shortcomings in the inventories filed by the State Boards but very few of them provide the required clarifications or file revised inventories to the Central Board where they are directed to do so.<sup>109</sup>

### 3.5 Transboundary Movement

The reported quantity of hazardous wastes imported and exported in India is less and forms a negligible fraction of the total hazardous waste that is handled and disposed of. In 2020-21, about 8,34,955 MT of imported HW had been recycled and utilized.<sup>110</sup> However, 1,49,337 MT of hazardous waste had been reportedly

imported in the same period.<sup>111</sup> This showcases the disparities in the actual and reported quantities. Further, about 2,635 MT of hazardous wastes had been exported.<sup>112</sup> In 2021-22 the quantity of imports rose to 0.33 million MT<sup>113</sup> but the quantity of export was only 982 MT.<sup>114</sup>

**Table 3**

Year	2021-22	2020-21	2019-20
Quantity of Waste Imported (in Million MT)	0.33	0.15	0.42
Quantity of Waste Exported (in Million MT)	0.001	0.003	0.01

### 3.6 Remediation of Contaminated Sites

Due to widespread pollution, several sites in the country have been tagged as contaminated.<sup>115</sup> Landfill production areas, dumps, waste storage and treatment sites, mine tailings sites, spill sites, and chemical waste handling and storage sites are commonly contaminated areas that are highly polluted by toxic and hazardous substances. As per reports, in the contaminated sites H-Acid was found in Madhya Pradesh, pesticides in Kerala, mercury in Odisha and Tamil Nadu, hexa-

<sup>111</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2020-21*. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2020-21.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2020-21.pdf). Accessed on: 13 June 2024.

<sup>112</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2020-21*. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2020-21.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2020-21.pdf). Accessed on: 13 June 2024.

<sup>113</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2021-22*. 2023. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2021-22.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2021-22.pdf). Accessed on: 13 June 2024.

<sup>114</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2020-21*. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2020-21.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2020-21.pdf). Accessed on: 13 June 2024.

<sup>115</sup> CENTRAL POLLUTION CONTROL BOARD. *Annual report 2020-21*. 2021. Available at: <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXNmMTQwM18xNjU1MzU0NzIxX2lZGhlcGhvdG8xNjQ3MS5wZGY=>. Accessed on: 13 June 2024.

<sup>107</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2021-22*. 2023. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2021-22.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2021-22.pdf). Accessed on: 13 June 2024.

<sup>108</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2021-22*. 2023. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2021-22.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2021-22.pdf). Accessed on: 13 June 2024.

<sup>109</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2021-22*. 2023. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2021-22.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2021-22.pdf). Accessed on: 13 June 2024.

<sup>110</sup> INDIA. Ministry of Environment, Forest and Climate Change. Central Pollution Control Board. *National inventory on generation and management of hazardous and other wastes 2020-21*. Available at: [https://cpcb.nic.in/uploads/hwmd/Annual\\_inventory2020-21.pdf](https://cpcb.nic.in/uploads/hwmd/Annual_inventory2020-21.pdf). Accessed on: 13 June 2024.

valent chromium in Uttar Pradesh, and Asbestos and Chromite in Jharkhand, etc.<sup>116</sup> The presence of these sites is not just restricted to commercial and industrial areas but has been also identified in residential, agricultural, recreational, and wilderness areas in rural as well as urban regions.<sup>117</sup> Further dumping or spillage of hazardous wastes and chemicals will further contaminate the areas causing adverse impacts on the environment. Contamination of soil, surface, and groundwater in the impact zones exposes people to known and unknown health hazards.

**Table 4**

No. of Contaminated Sites	No. of Probable Contaminated Sites	Sites that have been investigated and identified for remediation	No. of States with Contaminated Sites	No. of states where remediation work is in process	Total no. of remediations
112	168	28	21	6	11

Source: Annual Report 2020-21, Central Pollution Control Board, Ministry of Environment, Forest and Climate Change, Govt. of India.

Odisha, Uttar Pradesh, and Delhi have the highest number of contaminated sites in the country and the maximum number of probable contaminated sites are present in Delhi, Gujarat, Haryana, Karnataka, Madhya Pradesh, and Uttar Pradesh.<sup>118</sup> The process of remediation of contaminated sites has begun in India under the National Clean Energy Fund.<sup>119</sup> It is being carried out based on scientific assessment of the Source-Path-

way-Receptor scenario taking carefully into account the risks posed to human health.<sup>120</sup> However, as presented in the above table, the number of sites that have identified for remediation is significantly low in comparison to the number of contaminated and probable contaminated sites. Only 28 % of the states where contaminated sites are present have commenced remediation and as a result, only 11 out of the 112 contaminated sites are under the remediation process.

## 4 Conclusion

India has taken considerable steps in the transportation, management, and disposal of hazardous wastes but considering the pace of generation of hazardous wastes, the efforts seem inadequate. There has been an exponential rise in the number of hazardous waste generating units over the years which in turn has directly impacted the quantum of waste generated in the country. The number of TSDFs in the country has increased but still, 11 states in the country do not have proper facilities for disposing of hazardous wastes. Although on the brighter side, the number of industries filing annual returns has increased, the gaps in reporting continue to cripple access to complete information about the quantity of waste generated, its management, and sound disposal. Inconsistencies in data are a major roadblock to enhancing the existing infrastructure and regulations by the state and central governments, which needs immediate attention. Improper reporting should be checked by the State Pollution Control Boards and they should be more pro-active in collection of accurate data and submitting the same to the Central Pollution Control Board. Interstate movement of hazardous wastes for disposal especially between states that have adequate facilities require strict monitoring.

Despite an operating legal framework in place, many states continue to lack proper facilities for the disposal of hazardous wastes. The state governments and Central Government in a cooperated manner may address the infrastructural deficiencies and take adequate measures for mitigating the same. It is highly important that

<sup>116</sup> CENTRAL POLLUTION CONTROL BOARD. *Annual report 2020-21*. 2021. Available at: <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMTQwM18xNjU1MzU0NzkyX21lZGhlh-cGhvdG8xNjQ3MS5wZGY=>. Accessed on: 13 June 2024.

<sup>117</sup> CENTRAL POLLUTION CONTROL BOARD. *Annual report 2020-21*. 2021. Available at: <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMTQwM18xNjU1MzU0NzkyX21lZGhlh-cGhvdG8xNjQ3MS5wZGY=>. Accessed on: 13 June 2024.

<sup>118</sup> CENTRAL POLLUTION CONTROL BOARD. *Annual report 2020-21*. 2021. Available at: <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMTQwM18xNjU1MzU0NzkyX21lZGhlh-cGhvdG8xNjQ3MS5wZGY=>. Accessed on: 13 June 2024.

<sup>119</sup> CENTRAL POLLUTION CONTROL BOARD. *Annual report 2020-21*. 2021. Available at: <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMTQwM18xNjU1MzU0NzkyX21lZGhlh-cGhvdG8xNjQ3MS5wZGY=>. Accessed on: 13 June 2024.

<sup>120</sup> CENTRAL POLLUTION CONTROL BOARD. *Annual report 2020-21*. 2021. Available at: <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMTQwM18xNjU1MzU0NzkyX21lZGhlh-cGhvdG8xNjQ3MS5wZGY=>. Accessed on: 13 June 2024.



the threats posed by domestic hazardous wastes and E-waste on human health and environment are identified and proper information is disseminated for their sound management and disposal. Establishment of collection centres, recycling facilities, and disposal units for domestic hazardous wastes and E-waste is necessary for preventing hazards to human health and the environment.

There has been an increase in the quantity of recyclable waste in India and the number of recyclers, utilizers, and cement kilns utilizing hazardous wastes has also increased significantly. As an outcome, the quantity of undisposed wastes has not increased much in comparison to the increase in the quantity of waste generated. The hazardous wastes imported and exported form a very small fraction of the total wastes handled and disposed of in the country. However, there have been inconsistencies in the data pertaining to the quantity of hazardous wastes that are imported, which raise serious concerns about the sound handling of such wastes. The commencement of remediation works of contaminated sites has been a landmark step taken towards ameliorating the damage caused to the environment due to the dumping of hazardous wastes and other toxic substances. India has a very high number of contaminated sites, which is posing unknown dangers to people living in these regions. Therefore, the process of investigation and identification of contaminated sites and their subsequent remediation should be prioritized. Hence, while compliance with international environmental norms is a bare minimum necessity for our survival, going beyond them with a progressive approach to protect human health and environment should form an integral part of our futuristic policy.

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