

Solid Waste Management Laws and Sustainable Development: A Study in Assam

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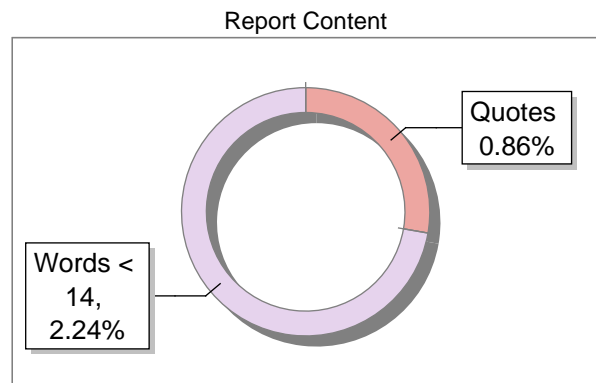
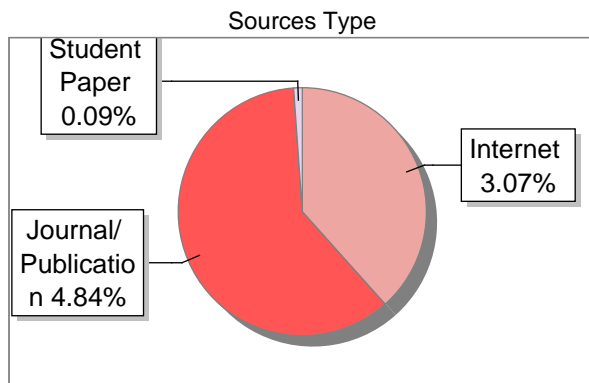
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DECLARATION

I, Jahnvi Bhandari, hereby declare that the thesis titled "**SOLID WASTE MANAGEMENT LAWS AND SUSTAINABLE DEVELOPMENT: A STUDY IN ASSAM**", submitted to Sikkim University in partial fulfilment of the requirement for the Degree of **Doctor of Philosophy (Ph.D) in Law**, is an original research work done by me under the supervision of Dr. Nidhi Saxena, Associate Professor (Supervisor), Faculty of Law, University of Delhi & Dr. Denkila Bhutia, Assistant Professor (Co-supervisor), Department of Law, Sikkim University. This thesis has not been submitted, in part or full, for the award of any degree or diploma at this or any other university/Institute.

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List of Abbreviations

AD	Anno Domini
AMDP	Assam Municipal Development Project
ASEAN	Association of South East Asian Nations
BIS	Bureau of Indian Standards
BCE	Before Common Era
BMW	Bio-Medical Waste
CE	Common Era
CFC	Chlorofluorocarbons
CG	Central Government
COI	Constitution of India/Indian Constitution
CPCB	Central Pollution Control Board
CRPC	Code of Criminal Procedure
CRSP	Central Rural Sanitation Programme
DMA	Directorate of Municipal Administration
DPCB	Delhi Pollution Control Board
DPSP	Directive Principle of State Policy
EPA	Environment Protection Act

EPR	Extended Producer Responsibility
FAO	Food and Agriculture Organisation
FR	Fundamental Rights
GHG	Greenhouse Gas
GIS	Geographic Information System
GMC	Guwahati Municipal Corporation
GMDA	Guwahati Metropolitan Development Authority
GoI	Government of India
GPGP	Great Pacific Garbage Patch
GPS	Global Positioning System
HC	High Court
HCFC	Hydrochlorofluorocarbon
HSLC	High School Living Certificate
ILO	International Labor Organisation
INC	Intergovernmental Negotiating Committee
IUCN	International Union for Conservation of Nature
MCD	Municipal Corporation of Delhi
MoEFCC	Ministry of Environment, Forest and Climate Change

MoHUA	Ministry of Housing and Urban Affairs
MSW	Municipal Solid Waste
NGO	Non-Governmental Organisations
NGT	National Green Tribunal
ODS	Ozone Depleting Substance
PCC	Pollution Control Committee
PG	Post Graduate
PIC	Prior Informed Consent
SAICM	Strategic Approach to International Chemical Management
SBM	Swachh Bharat Mission
SC	Supreme Court
SD	Sustainable Development
SG	State Government
SGD	Sustainable Development Goals
SPCB	State Pollution Control Board
SWM	Solid Waste Management
TPD	Tonnes Per Day
TSC	Total Sanitation Programme

TV	Television
UDHR	Universal Declaration of Human Rights
ULB	Urban Local Bodies
UN	United Naations
UNCED	United Nations Conference on Environment and Development
UNCHE	United Nations Conference on the Human Environment
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
USA	United States of America
UT	Union Territory
WHO	World Health Organization
WMO	World Meteorological Organization
WWF	World Wide Fund for Nature

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- Wing Commander Utpal Barbara and Others v. State of Assam and Others Case
No: Civil Rule No. 2999 of 1998)

List of Figures

Figure No.	Particulars	Chapter No.	Pg. No.
4.1	Distribution of Respondents by Gender and Age Group	4	111
4.2	Distribution of Having Knowledge About SWM by Gender	4	114
4.3	Types of Houses of Sample Waste Pickers	4	147
4.4	Working Hours of Waste Pickers	4	148
4.5	Daily Income Level of Sample Waste Pickers	4	150
4.6	Health Problems Faced by Sample Waste Pickers	4	151
4.7	Social Security Enjoyed by Waste Pickers	4	152

List of Tables

Table No.	Particulars	Chapter No.	Pg. No.
4.1	Municipality Profile in Assam	4	104
4.2	Total No. of Staff in MC/MB	4	106
4.3	Solid Waste Management Practices in the MC/MB	4	107
4.4	Vehicle Used for Waste Disposal in MB/MC	4	108
4.5	Information on Socio-Demographic Variables of Respondents	4	109
4.6	Number of Family Members in the Family	4	112
4.7	Duration of Stay in Municipality Area	4	113
4.8	Distribution of Sources of Knowledge SMW by Gender	4	115
4.9	Distribution of Knowledge of SWM by Educational Qualification	4	116
4.10	Distribution of Sources: Knowledge of SWM by Educational Qualification	4	117
4.11	Education/Training on Waste Disposal Mechanisms by MC/MB	4	119
4.12	Types of SW from Households	4	120
4.13	Types of Containers Used....	4	121
4.14	Availability of Public Dusbin Near the Locality of the Respondents	4	123

4.15	Solid Waste Container Emptied from the Locality ...	4	124
4.16	Nature of Disposition of Collected SW...	4	125
4.17	State of Public Bin Near the Locality...	4	126
4.18	Is the Solid Waste Disposal Mechanism a Problem	4	126
4.19	Do you consider that Improper SWD can lead to Environmental Degradation	4	128
4.20	Whom do you Consider Responsible for the State of Affairs	4	129
4.21	Do you ever Noticed Waste in the Roads....	4	130
4.22	Have you ever Noticed SW in Water Sources ...	4	131
4.23	Have You ever Noticed the burning of SW in Public Areas...	4	132
4.24	Do You Feel SWM is Responsible for Health Related issues	4	133
4.25	Respondents were asked about the presence of following in and around	4	134
4.26	Awareness of SWM Rules 2016 by gender	4	135
4.27	Awareness of SWM Rules 2016 by Educational Qualification	4	136
4.28	Efficient Legislation for Environmental Matters by Gender	4	137

4.29	Efficient Legislation for Environmental Matters by EQ	4	137
4.30	Do you Know About PIL?	4	138
4.31	What are the main Issues of Environmental Laws	4	139
4.32	Distribution of Variables for Score Compilation	4	141
4.33	Range of Score and Frequency Distribution	4	142
4.34	Level of Attitudes of the Respondents	4	142
4.35	T-Test Difference of Attitude	4	143
4.36	Age Group of Sample Waste Pickers	4	145
4.37	Educational Qualification of the Waste Pickers	4	146
4.38	Reasons for Waste Picking	4	146
4.39	Daily Collection of Waste	4	149

Contents

Page No.

Certificate

Plagiarism Certificate

Declaration

Acknowledgement

List of Abbreviations

List of Cases

List of Figures

List of Tables

Chapter -1: Introduction 1-21

- 1.1 Introduction
- 1.2 Review of Literature
- 1.3 Statement of the Problem
- 1.4 Objectives of the Study
- 1.5 Research Questions
- 1.6 Hypothesis
- 1.7 Research Methodology
- 1.8 Significance of the Study

Chapter -2: International Laws on Solid Waste Management 22-58

- 2.1 Introduction
- 2.2 International Environmental Laws
 - 2.2.1 Ramsar Convention 1971
 - 2.2.2 Convention Concerning the Protection of World Culture and Natural Heritage 1972
 - 2.2.3 Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973

- 2.2.4 United Nations Conference on Human Settlement Habitat I 1976
- 2.2.5 Convention on Migratory Species of Wild Animals ,1979
- 2.2.6 The World Climate Conference, 1979
- 2.2.7 World Conservation Strategy, 1980
- 2.2.8 World Charter of Nature, 1982
- 2.2.9 Brundtland Report, 1987
- 2.2.10 Helsinki Declaration, 1989
- 2.2.11 UNCED, 1992
- 2.2.12 Kyoto Protocol, 1997
- 2.2.13 Stockholm Convention on POP, 2000
- 2.2.14 Johannesburg Declaration, 2002
- 2.2.15 UN World Summit ,2005
- 2.2.16 UN Conference on Sustainable Development, 2012
- 2.2.17 Minamata Convention, 2013
- 2.2.18 UN Sustainable Development Summit, 2015
- 2.2.19 Paris Agreement, 2015
- 2.2.20 UN Climate Action Summit, 2019
- 2.3 International Laws Exclusively Dealing with Waste Management
 - 2.3.1 Stockholm Conference, 1972
 - 2.3.2 Convention on Prevention of Marine Pollution by Dumping Waste....1972
 - 2.3.3 Protocol to the 1979 Convention on Long Range Transboundary.....
 - 2.3.4 Vienna Convention, 1985

2.3.5	Montreal Protocol, 1987	
2.3.6	Basel Convention, 1989	
2.3.7	Bamako Convention, 1991	
2.3.8	Oslo Protocol, 1994	
2.3.9	Waigani Convention, 1995	
2.3.10	Rotterdam Convention, 1998	
2.3.11	EU on Waste Management	
2.3.12	Global Commitment, 2022	
2.3.13	Garbage Patch and International Efforts	
2.3.14	UN Plastic Treaty, 2022	
2.4	Summary and Analysis	
Chapter -3:	Solid Waste Management Laws in India	59-101
3.1	Introduction	
3.2	Historical Development	
3.3	The EPA, 1986	
3.4	Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989	
3.5	The Recycled Plastic Manufacture, Sale and Uses Rules, 1999	
3.6	Batteries (Management and Handling) Rules 2001	
3.7	Comparison between The Batteries Rules 2001 & Batteries WM Rules 2022	
3.8	Hazardous & Other Waste Rules..2016	
3.9	Bio-Medical WM Rules, 2016	
3.10	The E-Waste (Management) Rules, 2016	
3.11	Comparison between E-Waste Rules, 2016	

	& E-Waste Rules 2022	
3.12	SWM Rules, 2016	
3.13	The C&D Rules, 2016	
3.14	The Plastic WM Rules, 2016	
3.15	Regulation of Polychlorinated Order, 2016	
3.16	Regulation of Lead content.... Rules, 2016	
3.17	National Green Tribunal Act,2010	
3.18	Institutional and Regulatory Bodies	
3.18.1	Central Pollution Control Board	
3.18.2	State Pollution Control Board	
3.19	State Laws Relating to SWM	
3.19.1	The Guwahati Non-biodegradable...2006	
3.19.2	Assam Municipal Corporation Act 2022	
3.20	Evaluating the Challenges of SWM	
Chapter -4:	Challenges of Solid Waste Management in Assam	102-155
4.1	Introduction	
4.2	An Analysis of Municipality Data	
4.3	An Analysis of Household Data	
4.4	Hypothesis Testing	
4.5	Analysis of Data of Waste Pickers	
4.6	Challenges of Waste Management in Assam	
4.7	Best Practices of Waste Management	
Chapter -5:	Role of Judiciary in Waste Management in India	156-179
5.1	Introduction	
5.2	Right to a Healthy Environment	

5.3	Judicial Remedies..	
5.3.1	PIL	
5.3.2	Writ Petition	
5.3.3	Compensation and Damages	
5.3.4	Courts and Tribunals	
5.3.5	Injunctions	
5.3.6	Restoration and Rehabilitation	
5.3.7	Concept of Strict Liability....	
5.3.8	Public Trust Doctrine	
5.3.9	Contempt of Court	
5.3.10	Judicial Commission....	
5.4	Important Judicial Pronouncement Relating to the Environment	
5.5	Important Judicial Pronouncement Waste Management	
5.6	Powers of the Guwahati High Court	
5.7	Role of NGT in Environmental Matters in Assam	
5.8	Conclusion	
Chapter -6:	Conclusion	180-192
Bibliography		193-208
Annexures		

Chapter -1

1. 1 Introduction

Solid waste management has become a noteworthy problem because of the overuse of non-biodegradable materials. To address this challenge, several conventions and conferences have been held. Some of these are (i) the London Declaration 1972, (ii) The Basel Convention 1989, (iii) the Rotterdam Convention 1998, etc. The effectiveness of these Conventions depends on their functional implementation by the governments that are signatories. The development of environmental jurisprudence is demonstrated by the impact of the Stockholm Conference, which led to the adoption of several environmental laws in India.

The Brundtland Commission's 1987 report, "Our Common Future," introduced the idea of "Sustainable Development." It meets current needs without sacrificing those of future generations.

In the state of Assam sustainable development is observed as a crucial pathway towards achieving the vision of "ASSAM- 2030". This vision "ASSAM-2030" seeks to establish a developed and affluent state populated by happy, healthy, well-cared-for, and gainfully employed people. For this objective, the Government of Assam has identified 17 SD-related goals. (Government of Assam, Transformation and Development Department, 2016).

The Environment Protection Act (EPA) of 1986's Preamble states that the Act was drafted to implement the resolution of the United Nations Conference on the Human Environment, which will contribute to environmental improvement. Additionally, as stated in its preamble, the National Green Tribunal (NGT) Act, 2010 was established to carry out the decisions made at the United Nations Conference on

the Human Environment (UNCHE) in Stockholm in June 1972 and the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. These rulings will create effective access to legal and administrative processes while also safeguarding the environment.

Following the 1984 Bhopal tragedy and the 1985 Oleum disaster, environmental jurisprudence has gained prominence. These two occurrences led to the establishment of doctrines such as absolute liability in Indian environmental law. Many legal decisions argue for a healthy environment for humans. Article 21 of the Indian Constitution guarantees two essential rights: the right to personal liberty and the right to life. The right to live in a pollution-free environment is understood as part of Article 21 of the Indian Constitution. Numerous Indian court rulings support these interpretations. The Directive Principle of State Policy (DPSP) directs the government to improve the environment in addition to the Fundamental Rights. The Indian Constitution's Article 47 instructs the government to enhance citizens' quality of life by evaluating the general welfare of the citizens.

One of the numerous waste management programs run by the Directorate of Municipal Administration, Government of Assam, is the Assam Municipal Development Project, which provides a guaranteed water supply with sewage connection, the creation of green space, and the mitigation of pollution through the use of public transportation. Even though a budget had been placed for this program, no funding was approved because the Central Government did not approve it.

The Annual Report 2020–21 makes reference to the Implementation of Solid Waste Management Rules, (SWM) 2016. It claims that 1600389.9 TPD of solid garbage is produced in India overall. It is said that 31.7% of garbage is unaccounted for. Waste is produced as a result of the growth of new megacities and urbanization.

Biodegradable and non-biodegradable waste are two broad categories into which garbage can be divided. Examining past practices reveals that landfilling and burning are two methods of waste management that are hazardous to the environment.

The conventional practices are no longer feasible as they will cause more harm than good because practices like landfilling and burning will lead to groundwater contamination, which will further lead to overall environmental pollution. By keeping a note on these challenges, there is an urgent need to modify government programs and policies to maintain sustainable development.

Assam, the gateway of the Northeast, has a geographical area of 78,438 square kilometres, which is fragmented into 31 districts, 123 revenue circles, and 214 towns. Amongst these townships, 88 are statutory towns, and 126 are census towns. According to the 2011 census, Assam is home to 31.2 million people living in 26,395 villages.

The Government has set up a municipal board/corporation and waste disposal system throughout the country, but implementation remains a major challenge. Waste management problems are still present in cities throughout the state, including Guwahati, Tezpur, Silchar, Dibrugarh, and others. There are numerous Central laws that address the Solid Waste management in Assam.

1.2 Review of Literature

The purpose of the following literature review is to gain a better understanding of the connection between the goal of sustainable development in the state of Assam and the various solid waste management regulations. Through this literature review, the researcher tries to highlight the challenges and the opportunities for effectively

managing the waste in Assam, and it also tries to identify the potential areas for future research and policy intervention.

Right to a Clean Environment

A. Dhulia and R. Ganguly, in their Book Chapter entitled “Critical Assessment of Existing Environmental Legislation and Policies in India, Its Benefits, Limitations, and Enforcement,” published in *ResearchGate*. It emphasizes the preservation and sustainable use of the nation's natural resources. The book chapter also mentions various legislative frameworks to protect the environment. The author clearly provides a historical background for the need for environmental protection. It also talks about the various legislative steps undertaken for safeguarding the environment. Although this article focuses on numerous legislative measures and initiatives which are related to environmental protection in India, it does not focus on problems of waste management, climate change, and biodiversity loss, which are global issues. The article doesn't provide comprehensive information on India's legislative measures and policies specifically targeting these challenges.

Emmanuel Opoku Awuku's paper entitled “The Right to Clean Environment: Lessons from India and Tanzania” published in *Verfassung und Recht in Übersee / Law and Politics in Africa, Asia and Latin America*, 4. Quartal 1994, Vol. 27, No. 4 (4. Quartal 1994), pp. 516-532 states that new legislation is unable to effectively address the environmental issues and ecological disasters. The economically disadvantaged nations should be improved without the destruction of their natural resource base. The author also highlights the Stockholm Conference, the twenty-six principles, and the five major issues that were discussed in it. The paper compares various international and municipal laws and provisions associated with it

in the context of Africa. The Stockholm Action Plan is without legal binding provisions. Environmental rights are recognized by ASEAN states. The hilly slopes of Tanzania are affected by deforestation. Tanzania environmental problems are related to soil erosion, bush fires and refuse dumping. Tanzanians do not clearly mention environment protection provisions. Pollution control regulation in Tanzania is inadequate to handle clean environment policy.

K.L.Vibhute published his article entitled “Environment, Development and Law: Indian Perspective” in the *Journal of the Indian Law Institute, April-June 1995, Vol 37 No.2.* In 1972, he addressed the 1972 Stockholm Conference on Human Development, which aimed to safeguard the human environment. As a result of this conference, many countries throughout the world enacted new environmental legislation. The Government of India enacted several anti-pollution laws, including the Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, and the Environment (Protection) Act 1986. The CPCB and SPCB were created by the Water and Air Acts of 1974 and 1981, respectively. India needs a sustainable development policy, inserting into it the components of sound environmental laws. This will help to safeguard the planet and encourage public participation.

Linda Hajjar Leib, in his book entitled “Human Rights and the Environment” in the Chapter title “Theorisation of the Various Human Rights Approaches to Environmental Issues' ' published by *BRILL*. It draws attention to a number of theories about human rights in relation to the environment. Individual rights, such as the right to life, privacy, health, and a standard of living, are included in the expansion theory. Environmental Democracy is another important concept that

combines (i) the Aarhus Convention, (ii) international environmental procedural rights provisions, and (iii) the advantages of environmental procedural rights. The genesis hypothesis supports the understanding and recognition of environmental rights. However, this paper fails to explore the linkage between human rights violations with that of the ecological degradation.

Mohd Yousuf Bhat and Syed Damsaz Ali Andrabi, in their article entitled “Right to Life in Context of Clean Environment: Its Significance under Various Laws,” published in the *IOSR Journal of Humanities and Social Science in June 2017*. In this article, the author talks about the Right to Life from a global perspective. The authors highlight their understanding of the right to life by using instances from Rousseau, several Human Rights Conventions, the Rio Declaration, etc. In general, the study examines how environmental preservation and human rights are related, as well as how these rights might profit from a more defined framework. This article provides critical analysis, up-to-date information, and a broader range of perspectives; however, the article focuses on international perspectives and agreements, with limited discussion of regional or national approaches to environmental rights.

In the paper "Politics of Environment and Development in India" by **Raghav Sharan Singh**, published in the *Indian Journal of Political Science (vol. LXVIII, No. 4, Oct-Dec 2007)*, the author highlights the environmental challenges faced in India, which are primarily attributed to conditions of poverty, underdevelopment, and poorly planned and implemented development programs. The study highlights how important it is to realize the right to development in a way that equitably meets the environmental and developmental needs of present and future generations. The study identifies shortcomings in India's development planning, including a lack of clarity in

many laws' policy objectives and an inadequate assessment of the environmental impact. The paper did highlight the problems of punitive sanctions, which are based on deterrence theories, but it fails to state which theory will be best suited, considering the impact of the violation of environmental laws today. This paper fails to highlight the proper waste management systems.

Solid Waste Management and Legal Framework

C.M Jariwala, in his paper “Bio Medical Waste: Direction of Law and Justice” published in *Journal of the Indian Law Institute, JULY-DECEMBER 1999, Vol. 41, No. 3/4 (JULY-DECEMBER 1999), pp. 368-382*, highlights that medicare and related services generate infectious and hazardous waste, which is bio-medical. Bio-Medical Waste (BMW) causes Aids and hepatitis. The Apex Court of India gave a judgment in regard to the handling, management, and disposal of BMW. In the year 1998, the India Government passed the Bio-Medical Waste (Management and Handling) Rules. BMW Rules contain ten categories of bio-medical waste, such as human anatomical waste, discarded medicine, cytotoxic drugs, liquid waste, incineration, chemical waste, etc. The BMW Rules have certain loopholes, such as excluding small commercial Medicare shops, the power to blacklist, and the closure of the business of medical-related establishments, and educating the management as a whole.

Manjeet Singh, in his article entitled “A Critical Analysis of the Legal Control Mechanism for Solid Waste Management” in *“Journal of Legal Studies and Research, Volume 5, Issue 6, December 2019,”* emphasized the need for stricter legislation to control waste as it is a major concern. Singh also noted in his findings that although the SWM Rules provide a provision for the implementation of the bye

laws within one year, however, no such bye laws have been framed so far. Aside from that, this research report advocates the incorporation of the informal sector, such as rag pickers.

M. Balasubramanian, in his paper entitled “Economics of Solid Waste in India,” published in *Economic and Political Weekly, Vol. 50, No.25 (June 20, 2015)*, claims that India creates over 100 million tons of municipal trash every year. The author claims that across the nation, municipalities allocate between 5 and 25 percent of their budgets to solid waste management. In a similar vein, Indian urban local governments must pay between Rs 500 and Rs 1500 for every metric ton of solid waste. The author's work fills in some of the shortcomings in solid waste management in India, including inadequate waste collection and recycling mechanisms by municipalities, a lack of suitable guidelines, and a lack of data regarding cost analysis in municipalities.

Miho Hayashi, Rajeev Kumar Singh, Sudarmanto Budi Nugroho, and Premakumara Jagath Dickella Gamaralalage, in their Report entitled “Solid waste management policies and regulations,” Published by: *Institute for Global Environmental Strategies (2022)*, talk about the overall waste management in Indonesia. It highlights the different Acts and regulations that govern waste management. It also focuses on the governmental strategies to combat environmental pollution by establishing national policies that specifically target reduction and recycling initiatives. This report also highlights the emerging issues of plastic waste. Further, the report contains information about the waste banks as a means to promote the concepts like reduce, recycle, and reuse, which are known as 3R, and the struggle in waste reduction targets. The difficulties and obstacles encountered in putting waste

management policies into practice and accomplishing the objectives mentioned are not, however, covered in detail in the report.

Mithun Ray and Mijanur Rahman, in their article “An Overview of Legal Framework for Waste Management System in India with special allusion to SMW rules, 2016,” published their article in the *International Journal of Interdisciplinary and Multidisciplinary Studies (IJIMS)*, 2016, Vol. 4 No.1. The paper highlights waste management mechanisms in India. It is suggested that waste pickers and self-help organizations may actively participate in India's efforts to collect, separate, and recover recyclable waste.. Although the article briefly mentions the drawbacks of the SWM-2016 Rules, it fails to provide us with a detailed analysis with specific examples. Moreover, although it talks about integrating waste pickers or the self-help groups, it does not provide us with insights into how their integration will be beneficial and what legal adjustments must be made in order to include them in the organised sector.

Dr. P.K. Pandey, in their article “Management of Municipal Solid Waste in India: A Legal Study” in *Journal of Science Forum*, Vol. II, No.1, 2011. The author said that in order to achieve cooperation from the general masses, there should not be any demand for a fee from the public. Apart from this, it is often found that the vehicle of the waste collection is open, which could lead to environmental contamination, which is against legal norms. Although this article mentions the legal aspects, it only briefly mentions the Environment Protection Act, 1986, and the MSW (Management and Handling) Rules, 2000, and it doesn't emphasize the ineffectiveness of these Acts and Rules. There is a lack of detailed analysis or discussions about the legal framework and its effectiveness.

Shyamala Mani and Satpal Singh, “Sustainable Municipal Solid Waste Management in India: A Policy Agenda,” published in *Procedia Environmental Sciences Volume 35 (2016)*. The major gaps of the SWM rules 2015 are that there are no GPS/ GIS tracking systems, and synchronisation of the secondary containers is difficult. This paper fills in the gap of the SWM draft rules 2015 by focusing on its recycling part, working with the waste pickers, etc. The article illustrates that in order to make waste management more sustainable and to apply the R principle, that is, reuse and recycle, citizens, elected officials, and decision-makers must adopt new behaviours. One of the inadequacies of this paper is that it does not highlight the operational failure in the North East Region of India.

Vaishali Gupta, Sushma Goel, and T.G. Rupa, in their article “Good Governance and Solid Waste Management: An Overview of Legislative Regulations in India” in the *Journal of Business & Management Studies*, discuss that garbage produces GHG and affects climate change, etc. Authors also talk about the judicial intervention on Solid Waste Management, including various PIL filed in the Supreme Court for this purpose. Loopholes can be filled by proper strictness in the laws. Although this paper has highlighted the successful initiatives by the different state governments like Surat, Gujarat, Delhi, Kerala, Maharashtra, Rajasthan, however, it fails to highlight the Indore model of waste management. Moreover, it doesn't focus on the state where the waste management laws have not been implemented properly, like the Northeastern State of Assam.

Dr. Vijay Pal Singh, in his Article entitled “Law Relating to E-Waste Management in India: A Critical Study” in *International Journal of Management, Laws & Science Studies, IJMLSS, Volume 02, Issue 5, January 2018*, claimed that

India produced 5.9 million tons of hazardous trash domestically. The CPCB states that electronic waste is a big issue for future generations. The author suggested that rules and regulations should be strictly enforced in administering E-waste and protecting the environment.

Hazardous Waste Management

Bharati Chhibber in her article entitled “Challenges and Policy Responses to Hazardous Waste Management” published in *The Journal of International Issues, Vol. 19, No. 2 (SUMMER (APRIL-JUNE) 2015), pp. 86-99* mentions that hazardous waste comprises of radioactive materials such as power plants, toxic chemicals and biological waste. There is a lack of segregation of organic and inorganic waste at the household level. PIL was brought in the SC of India about the import of hazardous waste under the Basel Convention. Denmark, Germany, Austria, Finland, the Netherland, and Sweden are successful in managing hazardous waste. The article primarily focuses on the difficulties of hazardous waste management in nations that are developing such as India, while failing to appropriately address the role and obligations of industrialized countries in hazardous waste generation and disposal mechanisms. This forms a one-sided perspective as it fails to present a balanced view of the global hazardous waste problem.

C.M. Jariwala, in his paper “Hazardous Substance and Waste Law: Lessons for India,” published in the *Journal of the Indian Law Institute, July-December 2010, Vol. 52, No. 3/4*, noted that dangerous substances and garbage have a detrimental influence on the ecosystem. The legal regulation of waste and hazardous materials has been significantly assisted by the Judicial system of India.. He highlights that hazardous waste causes cancer, genetic mutation, birth defects, nerve damage, and

even death. Hazardous compounds were mentioned in the Vienna Convention of 1985. The illegal transport of hazardous waste is a felony, according to the Basel Convention 1989. Indian Parliament brought 151 substances to the list of hazardous substances for legal control.

Role of the Informal Sector in Waste Management

Ellen Gunsilius in his paper entitled “Role of the informal sector in solid waste management and enabling conditions for its integration: Experiences from GTZ”. *Transwaste workshop on the Informal Sector, Geneva. 2010* asserted that the organization's waste management system is insufficient for monitoring the disposal and recycling procedures. The author highlights the necessity of training in the unorganized sector in order to decrease waste deposition through the reduction and recycling process. Waste materials are transformed into tradable commodities with the assistance of the unorganized sector. However, they lack official recognition. The authors also mention the best practices of other countries, like Brazil, Egypt, etc. However, the authors fail to elaborate as to how these countries have successfully implemented the best practices and how these practices will be helpful in the case of India.

Dr. Ruli Borthakur, in her Article entitled “Socio-Economic Status of Rag Pickers in Guwahati City” in *Assam College Teachers Association Journal, Volume XLII, No.1 (January 2023)*, wrote about Guwahati City's rag-pickers' health, education, and socioeconomic problems. Her research indicates that these rag pickers make between Rs 3,000 and Rs 4,000 a month. The majority of these rag pickers live in unsanitary conditions, are illiterate, and are ill. In the Boragaon Area, there are over

200 rag pickers, the majority of whom are women. It was found that they are working under high risk concerning their health and safety norms.

Seth Schindler, Federico Demaria, and Shashi B. Pandit, in their article entitled “Delhi’s Waste Conflict,” published in *Economic and Political Weekly*, *OCTOBER 20, 2012, Vol. 47, No. 42 (OCTOBER 20, 2012), pp. 18-21*, recognized the part that private stakeholders play in trash management. Through PIL, the Municipal Solid Waste (Management and Handling) Rules, 2000 were created in response to Delhi’s sanitation crisis. In waste management, there is an immediate need for coordination and collaboration between the organized and unorganized sectors. Although the article mentions the public health issues of waste management, it does not explore the problem in detail, like the potential risk of open dumping, improper waste disposal, and the spread of diseases requires a more comprehensive analysis.

Sustainable Development

Kiran Pandey, “Only science can help the world achieve sustainable development: UN Report” published in *Down to Earth, Friday 13 September 2019*. It recognizes the shortcomings in progress toward the goals of SD and requires a fundamental change in the existing model of development, which has led to persistent poverty and is unsustainable. The report proposes renovating key human activities, such as food, energy, consumption, and production, and emphasises the role of science in achieving the SDGs through investment and collaboration. However, the article does not provide potential criticisms or challenges associated with relying solely on science to achieve sustainable development.

Pratyush Paras Sarma and Sagarmoy Phukan, in their article entitled “Understanding Assam’s Sustainable Issues,” published in *EPRA International*

Journal of Research and Development (IJRD) volume 6 Issue 2, February 2021, examine the gaps that have prevented the state of Assam from achieving the SDGs. This review article draws attention to Assam's poor performance in comparison to other Indian states. The official performance index published by NITI Aayog served as the basis for this ranking. The authors suggested sustainable development efforts by implementing the traditional practices that are helpful for the environment.

1.3 Statement of the Problem

Waste management is a major issue in Assam due to urbanisation, which generates a huge amount of waste in different districts of the state. Improper disposal of waste causes water pollution, air pollution, and soil contamination, which in turn negatively impact humans as well as other living organisms in the environment. The Supreme Court of India, through its interpretation, has inserted the Right to a Live in Pollution free environment as a part of Article 21 of the Constitution in the case of *In M.C. Mehta vs. Union of India*. Although development is a continuous process, without development, we cannot provide basic needs for the people. So development is part and parcel of economic growth. But unchecked growth results in environmental degradation. The rivers and their tributaries in Assam have become repositories of waste and pollutants, significantly weakening their capability to provide clean and safe drinking water to the people living in Assam. The flora and fauna found in water bodies, lakes, and wetlands are negatively affected by the pollution produced by the industries and agricultural waste. Another problem is the non-biodegradable materials that are used on a daily basis, like plastic bags, which do not naturally break down over the period of time, which is a worrying concern for the residents living in Assam. These bags contain injurious chemicals like cadmium and lead, which are often mixed up with the food items and, in turn, cause health-related

issues. The burning of plastic, paper, and other waste products at the sites of landfills releases various types of gases that adversely affect the ozone layer, and at the same time, it creates health hazards for the surrounding human population.

Addressing all the issues related to waste management requires the proper implementation of laws. Dumping of waste illegally has become a noteworthy problem, which marks a serious threat to the environment and promotes health risks. Laws are only the medium to combat illegal dumping by imposing penalties and enforcement measures. In order to achieve sustainable development, we need to highlight these issues through mass awareness programmes, and the various government and monitoring bodies have to uninterruptedly implement waste management laws and regulations whose objective is to endorse waste practices in order to protect and safeguard public health.

Several local governments have failed to frame and implement effective policy for the Solid waste management under Section 11(a),15(e), 15(zf) of the Solid Waste Management Rules 2016, which talks about a time frame for implementation of the state policy and bye-laws within one year. Also, the local government fails to achieve desired outcomes in waste management due to inadequate resources like proper training, proper funding, proper laboratory facilities, inefficient technical expertise, and limited capacities of regulating authorities. Local laws are important for managing waste as they play a crucial role in promoting recycling and making a favourable environment for recycling industries. Inadequate legislation may hinder the development of recycling facilities and the establishment of effective recycling programs. This may result in a higher volume of waste being sent to landfills instead of being recycled or reused. In the absence of any bye-laws relating to waste management in Assam, the Central legislation, such as the Solid Waste Management

Rules 2016, the Plastic Waste Management Rules 2016, the Bio-Medical and Waste Management Rules 2016, etc., is implemented in Assam for the purpose of Solid waste management. All these rules emanate from the Environmental Protection Act 1986, which lacks effectiveness in dealing with the current challenges of waste management.

The Environment protection Act 1986 is the pioneer law in India which plays a very crucial role in the protection of the environment however the coverage of this Act is insufficient as it fails to address the issues like sustainable development, climate change, biodiversity conservation which requires a more integrated and comprehensive framework and more importantly waste management which has emerged as matter of prime concern in recent times. The Government of India has tried to rectify these insufficiencies by implementing certain rules, like the Solid Waste Management Rules, 2016, etc. These rules tried to address the issue of waste management in specific domains, but they proved to be insufficient as an ad-hoc arrangement, in the form of this rule delegated substantial responsibilities to the local government. Apart from it, the Environmental Protection Act, 1986, has insufficient monitoring and reporting mechanisms. The penalties provided under the Environment Protection Act 1986 are not stringent in their operation. Moreover, the Environment Protection Act 1986 has a centralised decision-making process, which involves the approval of the Central Government for environmental clearance and approval, which often leads to delays in making decisions. Some of the developmental projects of the states require prompt approval; however, due to delays in approval, the projects remain pending for a long period of time.

Rag Picker, who are often known as Waste Pickers or waste collectors, plays a crucial role in waste management in the state of Assam. They are engaged in various

activities like collection, segregation, and recycling of waste. However, in the present rules, that is, the Solid Waste Management rules 2016, fail to recognize their rights in spite of their significant contribution to the waste management of the city. The local government has proved extremely inefficient in bringing waste pickers into the formal sector. Since the waste pickers are not trained properly, they don't do the work as specified under the provisions given by the Solid Waste Management Rules 2016. Waste Pickers who play a crucial role in segregating the waste generated from the source are mostly illiterate and ill-informed about the health hazards that are involved in the work in which they are involved. Being a part of the informal sector, they lack proper safety equipment and the skills to segregate the waste. These waste pickers are often involved in the informal sector, which makes it difficult for them to avail any legal benefits like the minimum wage, proper healthcare, resulting in their rampant exploitation. Although there is a mention in the Solid Waste Management Rules 2016 for recognizing the informal sector within the purview of waste management systems, their enforcement remains still a challenge.

1.4 Objectives of the Study

The Following Objectives are set for the present Study:

1. To find the relationship between development and the right to a healthy environment with special focus on the state of Assam.
2. To identify the challenges in the application of laws related to waste management in Assam.
3. To find out whether waste disposal laws and regulations meet the demands of Sustainable Development.

4. To identify the issues and challenges within the legal framework on the recognition and integration of waste pickers into the formal sector of the economy.
5. To explore the steps initiated by the legislature to meet the challenges of waste disposal.

1.5 Research Questions

The following Research Questions are to be asked:

1. How far are the Right to Development and Right to a Healthy Environment balanced under the existing Environmental laws?
2. Whether and to what extent the existing environmental laws regulate the promotion of reduction, recycling, reuse initiatives, and improper waste disposal practices in Assam?
3. What are the major issues and challenges in the legal framework for the recognition and integration of waste pickers into the formal sector of the economy?

1.6 Hypothesis

The following hypothesis is tested during the study:

1. *The inadequacy and ineffective implementation of existing environmental laws hinders the environmental sustainability in waste management practices in the state of Assam.*

1.7 Research Methodology

The methodology applied in this research work combines doctrinal and empirical methods. It will be analytical and descriptive. The doctrinal research approach was employed to assess how Assam's sustainable development was impacted by solid waste management laws. It comprises a comprehensive analysis of

primary legal sources, including legislation, Acts, notifications, and regulations, along with relevant judgments and orders issued by the judiciary and the National Green Tribunal. Secondary data and information are also included in this study. Various published and unpublished documents, books, journals, newspapers, magazines, electronic media, etc., will be among the secondary sources of data. In the empirical research, the area of data collection is from the various municipal boards and municipal towns.

Statistical Method

The surveyed data and information are analysed using a variety of statistical tools, including charts, tables, averages, percentages, and other relevant statistical procedures.

Sample Design

Random sampling was selected as the sample technique for the aforementioned research design. During the first phase, the researcher visited the Guwahati Municipal Corporation and spoke with the Chief Commissioner for over an hour. The Guwahati Municipality has provided detailed information about the waste management in Guwahati. This information has helped the present researcher to prepare an authentic schedule of questions. Simultaneously, relevant literature is consulted for the purpose. At the second phase, a pilot study was conducted in two municipal towns, Nalbari and Dibrugarh, to determine the suitability of the question schedules. Following the pilot research, improvements were introduced to the schedule of questions. After the completion of three districts, a survey was conducted in 8 districts of Assam. Altogether, eleven districts are selected for the study. There are 35 districts in Assam as per the 2011 census. Given the scope of the research, the

expense, as well as time constraints, it was determined to select 31.45 percent of the district of state. Thus, the sample size of the district is 11. Using the criteria of higher, medium, lower, hill station, and the Cachar district from the Barak Valley, the state's eleven districts are chosen. The districts of upper Assam are Dibrugarh, Sivasagar, and Tinsukia. The districts from middle Assam are Sonitpur, Bishwanath, and Morigaon; the districts of lower Assam are Guwahati, Goalpara, and Nalbari; the hill station is taken from Dima Haso district, i.e., Haflong, and from Barak Valley, Silchar municipality is selected for the study. From each municipal district, 50 household samples are collected. Thus, the sample size is 550.

Apart from the household samples, 11 municipal corporations/Boards are also interviewed, and necessary information relating to waste management is obtained.

The current researcher has conducted surveys in eight Assam municipalities, including Dibrugarh, Tinsukia, Sivasagar, Nalbari, Haflong, Silchar, Bishwanath, and Guwahati, in order to comprehend the socioeconomic and legal concerns of waste pickers. But in two municipality areas like Haflong and Bishwanth Chariali, waste pickers are not seen during the period of the field survey. A sample of 35 waste pickers is collected, of which 19 are male and 16 are female. The statistics were gathered from the Economic Survey of Assam, the Statistical Handbook of Assam, and other official publications.

1.8 Significance of the Study

An assessment of the Waste Management Laws aids in locating any legal loopholes and provides insight into the reasons behind issues with their application. The study is helpful for managing the waste properly, so that it leads to environmental sustainability in the state of Assam. At present, Assam is passing through air

pollution, water pollution and agricultural pollution, plastic problem, waste disposal problem, etc. The state can go ahead to achieve sustainable development with scientific waste management practices. The significance of the study is summarised as follows:

- Waste management creates employment for a large section of the people, both in the organised and in the unorganised sector in Assam.
- It helps to save the degraded environment of Assam and conserve the energy resources of the state economy
- It reduces the health hazard among the people of Assam, and reduces air and other pollution.
- It helps to save the water bodies and the river water of Assam
- It protects the animals and fisheries of the state.

Chapter-2

International Laws on Solid Waste Management:

2.1 Introduction

Solid Waste comprises plastic bags, glass bottles, packing materials, discarded shoes, tins, lead, batteries, etc. It is dumped in seas and oceans, which are consumed by marine animals, thinking it is a food item for them. The rejected resources generated from commercial establishments, household sectors, industrial sectors, mining and agricultural sectors, etc., can be referred to as solid waste.

Rapid urbanization and industrialization contributed faster generation of urban waste. Solid waste comes in many forms and from different sources. Hazardous waste comprises radioactive materials, electronic components, including automobile batteries, paints and solvents, chemicals, etc. Non-hazardous waste includes agricultural waste, plant and animal waste, etc.

There are international institutions, laws, and organizations that are assessing the global environment and its effect on living species. During the period of the Roman Empire, there was comprehensive planning about the “sink” of smoky chimneys. There were pollution control laws in Europe during the period of Middle Ages. The British Parliament passed the Metropolitan Commission of Sewers Act in 1848. This Act permitted the closure of cesspits around London with the help of the Metropolitan Commission.

The unbearable stench emanating from the disposal of sewage into the River Thames during the Great Stink of 1858 became so overpowering in the summer heat that it necessitated the evacuation of Parliament (Brimblecombe, 1987).

The approval to conserve the flora and fauna was granted by this convention, which took place in London on November 8, 1933.

During the period of World War II (autumn,1940), 17 countries of the world, such as Costa Rica, Chile, Argentina, the USA, etc., sat together in Washington, D.C to mediate an agreement to safeguard and conserve the western hemisphere's wildlife assets. They stressed the protection of wildlife species in protected areas and by notifying national parks (Hunter, Streeter, & Snape, 2022).

In order to protect and conserve whale species, the International Convention for the Regulation of Whaling (ICRW) was held in Washington, D.C., USA, on December 2, 1946. There are three main objectives of this convention. Firstly, it focuses on protecting all whale species from overhunting. Secondly, it ensures proper development and conservation of Whale stocks. And lastly, preservation of whale stock for the future generation (United Nations, n.d.).

In London, the great smog of 1952 created health problems, and the death toll increased by more than 4000. To protect the citizens of London from the smoke hazard, the Parliament passed the Clean Air Act,1956.

According to the report "More Growth Less Garbage," five case studies were conducted by five countries, which include the Philippines, Slovenia, the USA, Japan, and the Republic of Korea, for a successful decrease in residual waste. In 2008, the Cambridge of U.S., per capita generation of residual waste was 0.71 kilogram per day, which had declined to per capita generation of 0.51 kilogram per day in 2019. Recycling and effective city trash management are the main causes of this garbage's decline. In 2001, household garbage in the Japanese city of Yokohama was 0.73 kilograms per capita per day; by 2010, that amount had dropped to 0.46 kg per capita per day. The main reasons for this decline were reuse, recycling, and adequate

financial and technical support that the government gave to the households. It can be analysed from the case study that Japan's per/capita waste generation declined by 19 percent during the period from 2004 to 2017 (Kaza, Shrikanth, & Chaudhury, 2021).

Tacloban City, Philippines, launched a programme named Ecological Solid Waste Management in October 2016. They introduced a slogan in the household sector that is “No Segregation No Collection”. There are four waste segregation channels; they are biodegradable, recyclable, residual, and hazardous. It was found that waste dumped in landfills declined from 175 tons per day in the year 2016 to 121 tons per day by 2018.

Ljubljana is the capital of Slovenia. The country has 2 million inhabitants and it joined the European Union in the year 2004. Due to Proper management of waste, it became the European Green Capital in 2016. The city adopted door to door collection method for organic waste. The waste, which is recycled, is biologically treated and converted to energy. The city achieved a zero-waste objective in 2014 and has effectively cut residual garbage created at the household level by 59%. In the Republic of Korea total municipal waste generated was 1.95kg/capita/day in the year 1990. But by the year 2000, it was 0.98kg/capita/day. The total reduction was 50%. The recycling rate of food waste in 1995 was 2%, which increased to 95% in 2019.

2.2 International Environmental Laws

International environmental laws serve as an indispensable instrument in enhancing the management of waste by establishing global guidelines, advocating for sustainable practices, and encouraging cooperation among nations. Treaties like the

Basel Convention restrict the movement of hazardous goods across international borders. It provides guidelines for the environmentally conscious and safe management of hazardous waste. By supporting initiatives like the SDGs, which promote recycling and trash reduction, these regulations also promote sustainability.

Additionally, agreements like the Stockholm Convention aim to phase out harmful pollutants, ensuring safer waste management practices. By integrating waste management with broader sustainability targets found in agreements like the Paris agreement; International environmental laws offer a comprehensive structure for protecting human well-being and the natural environment, assisting countries in developing efficient and environmentally friendly garbage disposal systems. The following international legislation is connected to waste management and sound environmental practice in a broader sense:

2.2.1 Ramsar Convention 1971:

This convention was adopted in the year 1971. Stopping the loss of wetlands worldwide is the convention's main objective. The primary principle of this convention is to maintain wetlands through prudent use and management. There are three notable principles of this convention. The first principle advocates for the wise use of all wetlands worldwide. The second principle talks about the identification of appropriate wetlands which are of international importance and ensures their robust management and the third principle states that there should be international cooperation on transboundary wetlands. There are 172 contracting parties to this convention as of 21 July 2025 (Ramsar Convention on Wetlands, n.d.). There are 85 Ramsar sites in India in 2024. The largest Ramsar site in India is the Sundarban, which

is situated in West Bengal. There are 12 Articles in this convention. Some of these Articles are enumerated below:

Article 1 specifies that wetlands are any natural or man-made area that contains freshwater or saltwater, including areas of marine water.

Article 2 states that each party to this convention shall choose suitable wetlands which are of international importance in their territory based on zoology, botany, ecology, and hydrology.

Article 4 It is the responsibility of the parties who enter into contracts to promote the protection of wetlands and water streams through natural reserves.

2.2.2 Convention Concerning the Protection of World Culture and Natural Heritage (1972):

It was held from 17 October to 21 November 1972 in Paris. This convention contains 8 parts and 38 Articles. Part I deals with the definition of both Cultural and natural heritage. Part II discusses local and global conservation of natural and cultural resources, and Part III discusses the Intergovernmental Committee for the Conservation of Natural Assets and World Culture.

2.2.3 Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973):

Members of the International Union for Conservation of Nature (IUCN) adopted a resolution in 1963 that included this agreement. It is a global pact between several governments. Ensuring international trade in wild animal and plant specimens without endangering the existence of species is the main objective of this convention.

It came into effect on July 1, 1975. In order to prevent overuse of some rare species, this convention calls for international cooperation. In general, municipal laws are not superseded by this convention. The convention currently has 185 parties (Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973).

2.2.4 United Nations Conference on Human Settlements Habitat 1, 1976

The first Habitat conference was held in Canada in 1976. Its report consists of three parts and eighteen chapters. It also contains one Annex, which contains the Habitat forum. Part one contains the decisions taken in the conference, Part two gives the background of the conference, and Part three talks about the proceedings. This conference discusses the problems which are particularly prevalent in developing countries, such as rise in population growth, illiteracy, poverty, environmental degradation, world population growth, uncontrolled migration, rural backwardness, etc. This conference provides opportunities and solutions like making effective human settlement policies at the regional level, creating sufficient opportunities and participation, use of innovative technologies, effective means of communication, and collaborative effort on the part of the regional and world community at large. The following are some of the conference's guiding principles:

- Principle 1 is concerned with improving the level of living.
- Principle 2 highlights the needs of disadvantaged communities.
- Principle 3 deals with economic development
- Principle 4 deals with right to live with human dignity
- Principle 6 talks about freedom of movement
- Principle 11 deals with protection from unwanted exploitation

- Principle 12 deals with misuse of weapons
- Principle 13 deals with the right of individuals and individuals as a member of society to take part in policy making.
- Article 19 deals with achieving international cooperation through collective efforts.

To achieve the above, the convention recommends that the government of the country and the international organization formulate proper strategies and plans through collective effort at the national level.

2.2.5 Convention on Conservation of Migratory Species of Wild Animals (1979):

This convention has 130 parties. With the support of UNEP, this convention was finally concluded. Under this convention, endangered species and migratory species are included, which need conservation through international agreements (Convention on the Conservation of Migratory Species of Wild Animals, n.d.).

2.2.6 The World Climate Conference (1979):

This is the inaugural World Climate Conference. It begins in Geneva on February 12th and runs through February 23rd, 1979. It was funded by the WMO. Four factors are the emphasis of the conference: research, integrated impact analyses, climatic data, and applying knowledge (World Meteorological Organization, 1979).

2.2.7 World Conservation Strategy (1980):

It was commissioned by both the WWF and UNEP. It provides financial assistance for the preparation of the basic themes and structure of the global

conservation initiative. The aim of the World Conservation Strategy is listed below (IUCN, n.d.):

- It is a conservation of living resources for human survival while also achieving sustainable development.
- This strategy identifies the priority conservation issues and to deal with them.
- It also proposes an efficient waste for achieving the strategy aims and objectives.

The World Conservation Strategy targets the following areas:

- It sets out rules for conserving living resources
- preservation of vital ecological functions.
- The protection of genetic variety.
- Sustainable utilisation of species and ecosystems.

2.2.8 World Charter of Nature (1982):

In 1982, the UNGA adopted the World Charter for Nature. It contains twenty-four Principles. The general principles urged for the respect of nature, uncompromised genetic viability of the earth, optimum sustainable production from ecosystem and organism, conservation, and special protection to rare and endangered species (United Nations, 1982).

2.2.9 Brundtland Report (1987):

It was published in October 1987. It contains the following features:

1. *Threaten Future*: The future is threatened because of environmental degradation. Environmental degradation occurs because of the rising demand for scarce resources on the planet. According to the report, 340 million individuals lived in poverty in 1980 in 87 developing countries. Greenhouse

gas emissions, loss of forest cover, radioactive waste, desertification, and other environmental issues are jeopardizing the planet's future.

2. *Sustainable Development*: It considers both present and future generations' needs. Institutional development, education, and law enforcement are examples of equitable and common interests in sustainable development.

The strategic imperatives of sustainable development include reviving growth patterns, improving growth quality, maintaining a sustainable population level, meeting basic needs, protecting and developing the resource foundation, technological advancement, and harmonizing the environmental issues and finances.

3. *Role of International Economy*: The African continent, which suffers from poverty, hunger, a shortage of savings, a rise in infant mortality rate, a lack of education, and a rise in population rate, should be given sufficient attention by proper planning and by making effective policies. Latin American countries experienced growing poverty, deteriorating environmental conditions, as well as external debt in the 1970s. There is a need for the legitimate interests of creditors and debtors to share the burden of debt crises.

4. *Population and human resources*:

During the period between 1881 to 1910 Europe observed a 20 percent rise in the permanent emigration population. Improvement and health and education especially among women can bring down population growth rate. Empowering the vulnerable groups found in Amazon basin, Australia, North America, Desert of North Africa, forests and hills of Asia helps to achieve sustainable development policy.

5. *Food Security*: In Africa, there has been a considerable decrease in food production per capita of 1 percent since 1970 onwards. In West and North Africa, there has been a decrease in arable land, making food self-sufficiency a challenge. South and East Asia are suffering from deforestation and rural landlessness. The demand for food will increase as the population increases; therefore, urgent strategic plans for food security, such as government intervention, need to be taken. Also, proper water management and eradication of pollution water crucial for food security.
6. *Species and Ecosystem*: There has been extinction. The problem of species extinction is extensive and growing, driven by habitat destruction, climate change, pollution, over-exploitation, and invasive species. A proactive approach, anticipating threats and implementing preventive measures, is necessary.
7. *Energy*: There is an unequal international distribution of energy consumption due to industrialization, urbanisation and societal affluence. Due to this uncertainty in wealth distribution and high consumption of use of energy in future gives rise to four important assumptions:
 - Climate change due to greenhouse effect
 - Air pollution
 - Acidification
 - Nuclear reactor accidents.
 - Decline in fuelwoods

This could be tackled down by implementing the following:

- Proper assessment and improved monitoring technique

- Conducting proper research
- Collective international policies
- Implementing policies and plans dealing with climate change and the rise in sea level

8. *Industry* : Industrial growth during the period from 1950 to 1973 was 7 percent per annum in the manufacturing sector and there was a growth of 5% in the mining sector. Most of the developing nations had no modern industrial sector at the time of their independence. The share of world production in the case of iron steel in developing nations increased from 3.6% to 17.3% between 1955 to 1984. To avoid incidents like the Bhopal tragedy (1984), the disaster of Mexico City (1984), Chernobyl disaster (1986), Basel disaster (1986), etc., it is important to maintain regional and national cooperation. There is a need to follow the guidelines of safety operations in industrial plans, use policies of regional development plans and provide adequate training to the workers, prepare contingency plans etc.

9. *Urban Challenge*: Due to the rise in population, there is an urban revolution due to the increased number of cities. As the urban area delivers proper healthcare facilities, power, sufficient resources, expert staff therefore it attracts people with a hope of standard human life due to which it leads to mushrooming of population and illegal settlements. This mushrooming of illegal settlements has torn the urban fabric with overcrowding and overuse of public places, water scarcity, food scarcity, and an increase of disease and pollution. Some of the important points to eradicate this challenge of mushrooming of population are: encouraging de-concentration, by encouraging growth of secondary centres, avoiding excessive concentration of

administrative power, decentralised provision of government service, and adopting a strategy that is complementary and not contradictory to the rural and urban development.

10. *Managing the commons*: Managing the commons includes balancing the oceans, space, and Antarctica. The landbase byproduct of human activities like septic tanks, industrial waste, and polluted discharges should be properly managed. Ocean management needs national action plans based on the coordination and cooperation of the international agencies.
11. *Peace, security, development and environment*: The major conflict among nations is environmental stress. Wars, famines, poverty, environmental degradation, and political conflicts are the major hindrances to achieving SD. (World Commission on Environment and Development, 1987).

2.2.10 Helsinki Declaration (1989):

This declaration provides guidelines relating to ethical principles which should be followed by the medical practitioner as it involves the human subject. These principles are fixed by the World Medical Association. Some of the key principles which are provided in part I of this convention are :

- Before operating human subjects a deep and pervasive knowledge of the existing literature is crucial.
- The protocol to be adopted should be properly formulated.
- The procedure to be applied on the human subject should be conducted by such a person who is entitled and competent to do so.
- Research is allowed only if the importance of the objective justifies the inherent dangers to subjects

- The publication which does not adhere to the principles should not be accepted.
- There should be prior informed consent of the research subject.
- Legal and ethical consideration should be taken into account.

Part II of this declaration deals with medical research combined with professional care. It includes use of new methods for saving lives, providing best care, informed consent, research justification etc.

Part III of this declaration deals with non-therapeutic biomedical research which involves human subjects. This part covers key areas like protection of subjects involved in the non-therapeutic process, voluntary participation, discarding of harmful research which do not care about individual well-being, ethical priority etc.

This Declaration principally addresses ethical considerations in medical research that involves human subjects. However, it can be indirectly related to waste management. Firstly, it contains that the researchers should be careful if their work might harm nature. So, they should handle medical waste responsibly to keep the environment safe. Secondly, ethical guidelines mean researchers should think about how their work affects everyone. That includes properly getting rid of medical waste to protect people and the environment. Thirdly, this declaration tells researchers to stick to the law and ethical rules. That includes following waste management rules to safely get rid of medical and lab waste. Although the declaration doesn't directly talk about waste, its ideas of being careful, thinking about the environment, and following rules naturally lead to doing waste management responsibly in medical research (World Medical Association, 1989).

2.2.11 United Nations Conference on Environment and Development (1992):

It developed a new Roadmap for worldwide engagement on global development concerns and their environmental implications. It promoted the idea of SD in the global economy. It has 27 universal principles. This conference also set up the Commission on Sustainable Development. This Declaration reaffirmed faith in global partnership with cooperation among states of the globe. It also attempts to work towards international agreements, taking into consideration global environmental and development mechanisms. It has 27 principles, some of the principles are (United Nations, 1992):

- Principle 1 stated that sustainable development with a healthy and productive living can be achieved in the natural environment.
- Principle 4 focuses on environmental protection to attain sustainable development.
- Principle 5 deals with the cooperation of all states in eradicating poverty.
- Principle 6 provides special priority for least developed countries.
- Principle 7 deals with global partnership to protect the Earth's ecosystem.
- Principle 9 discusses cooperation between different states in the case of the transfer of technology and innovative ideas.
- Principle 10 states that parties to this convention shall encourage participation and mass public awareness relating to environmental issues.
- Principle 11 discusses that states shall pass proper environmental legislation.

2.2.12 Kyoto Protocol (1997):

This Protocol came into force in the year 2005. Under this convention, developing nations were ordered to cut down greenhouse emissions of gases, namely methane, nitrous oxide, carbon dioxide, hydrofluorocarbons, etc, between 2008 and 2012. This protocol was modified in the year 2012 to incorporate an additional gas, such as Nitrogen Trifluoride, within a period which ranges from 2013 to 2020 (UNFCCC, n.d.).

2.2.13 Stockholm Convention on Persistent Organic Pollutants (2000):

It took place in 2000 and became operative on May 17, 2004. It is a global agreement whose principal purpose is to protect individuals and the natural environment from pollutants emitted into the air (Secretariat of the Stockholm Convention, 2023).

2.2.14 Johannesburg Declaration (2002):

South Africa hosted the Johannesburg Declaration in 2002. The main objective of this declaration is to safeguard and manage the planet's resources for economic growth. This declaration stresses poverty eradication, which focuses on eliminating poverty as a fundamental aspect of SD. The necessity of shifting toward sustainable production and consumption is also covered in the strategy. It includes a focus on Africa, with tailored schemes for sustainable development on the continent. The plan outlines the means of implementation, describing the resources and methods necessary to achieve its goals (United Nations, 2002).

2.2.15 UN World Summit (2005):

It focuses on international law, judicial principles, and colonial countries' right to autonomy. The summit agreed to the MDGs. It acknowledges how critical it is to raise money for developing nations. This summit supports operationalization of the World Solidarity Fund. The 2005 World Summit focuses on foreign direct investment in developing nations. This Summit also supports the role of International Banking and financial institutions. There is also a need for private financial support to developing nations. An important source of capital for developing countries is debt financing and relief. The Group of Eight suggested a hundred percent debt cancellation of poor countries. It supports trade liberalisation under the multilateral trading system. The export sector of developing nations should have market access for their products. The commodity-dependent countries should restructure their economies for competitiveness as a global player.

Under quick-impact initiatives, the 2005 World Summit focuses on agreed development goals, international cooperation, and support for long-term development goals, anti-malaria treatment programme, school meal programme, etc. It reaffirmed commitment to the transition of Bretton Woods institutions. It addresses issues related to trade, technology, international finance, and investment for developing countries.

The 2005 World Summit recognizes South-South Cooperation, which is listed in the Doha Declaration and the Doha Plan for Action. It also supports a global system of trade, which is favourable for developing nations. The United Nations Development Programme under South Cooperation promotes the needs of developing countries. The World Summit reaffirmed commitment to food security, rural development, agricultural development, eradication of hunger, malnutrition, and

inequality in the agenda for national development. It supports work for all and the Right to work (United Nations, 2005).

2.2.16 The United Nations Conference on Sustainable Development (2012):

This conference has accepted that poverty reduction is the greatest challenge of modern times, and freeing humanity from hunger is the need of the hour. It also takes into consideration the goals of the UDHR, the Rio Declaration, the MDGs, the Johannesburg Declaration, etc. The Green Economic policies for promoting sustainable development should :

- Be in the same line with international law
- Respect the territorial integrity of the particular country.
- Supported by the government, including stakeholders and private players, etc.
- Support the development, new opportunities, and support for human rights.
- Promote the reduction of unjustified disparities like restrictions on international trade, technological inequality between industrialized and less developed countries.
- It supports the welfare of indigenous groups.
- Emphasizing productive activities that will minimize the poverty rate of the country.
- Emphasizing sustainable production patterns.

The framework of Actions highlights the important areas to be followed up, like eradicating poverty, water and sanitation, promoting modern sustainable energy, sustainable transport, sustainable cities, tourism and human settlement, promoting

good health, equal pay for equal work, protecting oceans and seas from pollution and exploitation. It also emphasizes the support and the necessity of the developing economies, African countries, Island nations, and landlocked countries. This convention deals with issues of the environment like Climate change, disaster management assessment, protection of forests, biodiversity, etc.

The primary goal is to accomplish ecologically secure handling of chemical and hazardous waste by 2020, in accordance with the Johannesburg Plan's principles, in order to reduce negative impacts. Addressing new and growing difficulties in this field requires an integrated and efficient strategy. All countries need to make progress and bridge gaps in implementing these measures. There is support for greater coordination among the Rotterdam, Basel, and Stockholm Conventions, as well as their collaboration with SAICM. Adopting Comprehensive waste management policies is needed to tackle challenges such as electronic waste and plastics. Measures must be taken to prevent unsafe, hazardous waste management and illegal dumping. (United Nations, 2012).

2.2.17 Minamata Convention (2013):

It is an International Treaty on Mercury, which tries to recognize the negative effects of mercury. The said convention also states that proper and efficient management of mercury is required. This convention also recognizes the WHO's efforts in safeguarding the health of human beings from the harmful effects of mercury. This Convention contains 35 Articles. Some of the important Articles of this Convention are enumerated below (Minamata Convention Secretariat, 2024):

Article 2 of this convention defines different terminologies like mercury-added product, party, primary mercury mining, regional economic integration organization, etc.

Article 3 of this convention outlines that each participating country or "Party" in the agreement will make an effort to identify two important things related to mercury that are individual stocks and sources of mercury supply.

Article 4 outlines the importance of handling and taking measures of mercury by each contracting party, which is mentioned in Part II of Annex A as per the provision mentioned in this convention.

Article 16 declares that the conventions' parties are required to consult as well as collaborate with the ILO, WHO, and other relevant organizations to protect vulnerable populations from health hazards.

Article 20 deals with implementation plans by taking into consideration the domestic circumstances of contracting parties so as to coordinate the regional plans relating to implementation.

Article 25 enumerates how the dispute resolution will take place.

2.2.18 United Nations Sustainable Development Summit (2015):

This summit is the 70th session of the General Assembly, which was conducted from 25-27 September 2015. This summit was addressed by over 200 speakers in the plenary session. Mainly, this summit discussed the 2030 agenda for the seventeen SDGs, and it also talks about sustainable development. It also highlighted the national and international achievements. Global partnership, different

needs of the country, private and public partnership, use of new innovative technologies, common and differentiated responsibilities, and strong and effective review mechanisms were prudent to combat climate change. The 2030 agenda should be based on 'Fit-for-Purpose', and it should highlight today's scenarios.

Interactive dialogue 1 focuses on eradicating poverty and hunger, as it is concerned about human dignity. In order to eradicate poverty and hunger from a multidimensional perspective, national ownership and political commitment, finance, youth employment, appropriate risk management, and basic infrastructure, including food, education, security, nutrition, and equality, are crucial. Interactive dialogue 2 deals with women empowerment, reducing the gap between have and have-nots which can only be possible if access to education becomes a universal process, equal opportunities are there in the economic sphere, representation of women in politics, community-level access to equal opportunities, and by combating violence against women.

Interactive Dialogue 3 deals with achieving sustainable growth by promoting sustainable economic growth, raising the standard of living, value-added productivity, international participation in trade, more investment in Africa, and shifting the focus towards sustainable living.

Interactive dialogue 4 highlights dealing with climate change, sustainable biodiversity, and collaborative effort.

Interactive dialogue 5 is building transparent, accountable, and efficient institutions.

Interactive Dialogue 6 is on enhancing global partnership relating to post-2015 development. It deals with the capacities of regional players, and enhances the monetary sectors like public funding, investments, and having a transparent monitoring system (United Nations, 2015).

2.2.19 Paris Agreement (2015):

The key provisions related to the Paris Agreements are as follows:

- The agreement acknowledges the urgent need to address climate change through scientific applications.
- Recognizes developing economies' unique requirements and conditions.
- It also identifies the distinct conditions and specific necessities of the parties of developing nations as incorporated in the convention.
- The necessity of ensuring food security and eradicating hunger is acknowledged by the signatories to this agreement.
- This agreement also recognizes the importance of a sustainable lifestyle in consumption.

There are 29 Articles of the Paris Agreement.

Article 4 deals with Greenhouse Gas (GHG).

Article 6 recognizes that certain parties should adopt voluntary cooperation in order to implement their nationally determined contribution to achieve environmental integration and sustainable development.

The goals established by the Paris Agreement of 2015 are unrealistic to achieve, as there is a lack of enforcement mechanisms. The Sahel region of Africa's aim does not shield its people from the adverse effects of the changing climate. (What Is Green

Living, 2025). The Trump administration had disassembled its regulations of the Paris agreement and withdrawn from it; nevertheless, the Biden administration re-engaged with this agreement. Also, the Bolsonaro Government in Brazil has recognized its agreement, but it has relaxed the environmental rules, which led to deforestation and forest fires in the Amazon Basin. Even in India, the Modi Government regime weakened domestic environmental regulation (Zargar, 2021).

2.2.20 United Nations Climate Action Summit (2019):

According to the Report of Climate Action Summit 2019, 1.5 °C is the permissible limit of global warming for the 21st century. By the year 2050, it is targeted that there will be net-zero emissions of GHG. It was stated that developing countries received financial support from both public and private financial institutions as per the objective of the Paris Agreement. Many countries at the summit pleaded to minimize the use of coal. More than 20 countries of the globe are committed to conservation, reforestation, and restoration of the ecosystem as a whole. The summit also highlights the importance of investing in sustainable cities, which provide social and economic benefits to their citizens. The summit will work to develop a sustainable transport network and sustainable urban infrastructure projects. To achieve short-term and long-term enrichment of people's health, the summit supports climate solutions in order to improve air quality. By 2015, the summit aims to decarbonize the shipping sector. A Task Force for clean energy transition will be set up, it is based on a free pillar approach, such as Building capacities in developing nations, diplomatic relations, and supporting ground realities in key countries of the globe. The summit took initiatives for setting up the Clean Air Fund by raising 50 million dollars. The Powering Past Coal Alliance is committed to working with 32

countries, 25 sub-national governments, and 34 companies to achieve clean energy. The summit also supports the concept of One Planet Business for Biodiversity. The loss of forests and decline in forests are issues that the Central African Forest Initiative is dedicated to tackling. By 2030, the worldwide environmental movement aims to preserve and safeguard 30% of the planet's land as well as ocean.(United Nations, 2020).

2.3 International Laws Exclusively Dealing With Waste Management

Apart from this, there are conference and conventions which exclusively deals with waste management, they are

2.3.1 Stockholm Conference (1972):

It was attended by 113 member countries. There was a discussion to resolve the issues of pollution between developing and developed nations. It contains 26 principles(United Nations, 1972).

Principle 1 stresses the moral responsibility of global citizens to preserve and enhance the global ecosystem.

Principle 6 mentions that all countries of the globe should be protected from environmental pollution.

Principle 7 declared that all possible actions should be made to protect and avoid pollution of the oceans by substances.

Principle 10 deals with the environmental management of developing countries.

Principle 19 underlines the role of environmental knowledge, such as imparting environmental education to the youths, adults, and underprivileged sections of society.

Principle 20 deals with scientific research and development, and developing countries should benefit from such environmental technologies.

Recommendation of Stockholm: One of the important Stockholm recommendations was that the World Health Organization should increase its support to various governments of the globe in order to improve safe water supply and better sewage management through its community water supply program. The development assistance will focus on setting up water supply services and all types of solid waste

2.3.2 Convention on Prevention of Marine Pollution by Dumping of Waste and Other Matters (1972):

This convention has been enforced since 1975. The salient features of the convention are as follows (International Maritime Organization, n.d):

- It forbids radioactive waste from being dumped at sea.
- An amendment took place in the London Convention in 1994 banned the incineration of waste at sea.
- At the end of 1996, it was illegal to dispose of commercial garbage at sea.
- In the year 2013, an amendment was made to the London Convention, which permitted ocean fertilization activities for exclusively research purposes and, at the same time, enabled the regulation of other marine geoengineering activities in the future.

- In October 2022, a meeting took place between the parties to the convention, which proposed to eliminate sewage sludge from the list of permitted materials for dumping. It has a total of 22 articles and contains three annexes (U.S. Environmental Protection Agency, n.d.).

2.3.3 Protocol to the 1979 Convention on Long range Trans-Boundary Air Pollution on Persistent Organic Pollutant:

The salient features of this convention are as follows (United Nations Economic Commission for Europe, 1998) :

- This agreement recognizes that organic pollutants concentrated far beyond their point of origin in North America, Europe, and the Arctic Region.
- It also recognizes that the biomagnification of particles poses a threat to the Arctic Region's ecosystems.
- This convention also mentions precautionary principles
- There are 20 Articles in this convention.
- The purpose of this treaty is stated in Article 2. It deals with the reduction, restriction, and discharge of pollutants.
- It includes the provision about the fundamental duties, and it contains the information for the general public.

2.3.4 Vienna Convention for Ozone Layer (1985):

It was held in 1985 in Vienna. It states that there is a need for cooperation and coordination, promotion of research, and an exchange of information. The UNEP's regional seas agreements, which had framework conventions and mandatory protocols, served as a model. Despite this, the Vienna Convention was signed in

March 1985 without such a protocol. The ozone agreements were unique because they dealt with long-term problems where the effects of today's actions wouldn't be seen for decades. Decisions were based on predictions, as the damage hadn't yet happened. The agreements needed to be flexible to adapt to new scientific findings. Since no single country could solve the problem alone, international cooperation was essential (UNEP, 1985).

2.3.5 Montreal Protocol on Substances that Deplete the Ozone Layer. (1987):

By reducing the release of ozone-depleting substances (ODS) into the atmosphere, this convention seeks to protect the ozone layer. This convention also makes an effort to establish steady reduction requirements for both developed and developing nations with regard to compounds that deplete the ozone layer, which include halons, HCFCs, and CFCs. These regulations apply to a variety of industrial sectors, eventually leading to the cessation of the use of certain hazardous compounds over time.

The consumption and production of ODS are regulated by these multilateral environmental agreements. All 198 UN Member States have ratified this protocol. International Cooperation with regard to research and technology is required to prevent the emission of ODS, which depletes the ozone layer.

This protocol has 20 Articles and one Annex A. Some of the Articles of this convention are mentioned below (United Nations, 1987), such as Article 1 is related to the definition of the terms used in this protocol, such as Convention, parties, secretariat, control substance, production, consumption, calculated levels, and industrial rationalization.

Article 5 of this protocol provides access to substances and technology that are eco-friendly to the developing nations.

Article 6 specifies the evaluation and review of prevention strategies based on the availability of technical, environmental, economic, and scientific data.

Article 9 provides information on public understanding, research and advancement, and information sharing through capable international organizations.

Article 10 of this convention stated the need for work plans for the developing nations.

The Montreal Protocol establishes some enforceable programs to satisfy responsibilities for both developing and developed nations, covering the key ODS, such as chlorofluorocarbons, halons, and hydrochlorofluorocarbons. It has a positive impact on the ozone layer because it reduces the climate effects of ozone-depleting substances to a large extent.

2.3.6 Basel Convention on Hazardous Waste (1989):

The transfer of garbage from developed to developing countries is prohibited by this convention. This convention highlights that hazardous waste disposition is a sustainable manner. One of the most essential characteristics of this convention is that it restricts the transfer of hazardous waste with countries who are not parties to it. This Convention came into force in 1992. There are currently 113 member countries that have participated in these conventions. The regulatory approach of this convention is to set up a 'prior informed consent' (PIC) regime. If a contracting party permits the importation of goods, the exporting state's government is obligated to provide advance notification to the governments of the transit states. The exporting country

may allow exporters to use a general notification procedure for a period of one year for numerous shipments of the same kinds of wastes, as per the agreement made by the importing party. Generally, this convention puts restrictions on exports from parties to non-parties, and at the same juncture, it restricts transboundary movements of wastes. The Basel Ban Amendment was approved at the third conference. It was held in the month of September 1995 in Geneva. This amendment put a greater restriction on waste shipments. (UNEP, 1989).

2.3.7 Bamako Convention (1991):

African nations claim that the Basel Convention does not impose any limitations on the movement of hazardous waste across international borders. At the start of the Basel Convention, Sub-Saharan African nations did not sign it. This convention now forbids the importation of hazardous waste into African countries. The African Union's 12 members negotiated this accord in January 1991. It was enforced in 1998. It consists of 35 signatories and 30 parties as of 14/02/2023 (Organization of African Unity, 1991).

The following characteristics are examined in this convention's preamble:

- Hazardous waste is regarded as an immediate threat to both the ecosystem as well as human well-being.
- Reduced hazardous waste output.
- Transboundary movements of hazardous waste
- Responsibility of the generating party for handling the waste committed by them.

Apart from the preamble, this convention consists of 30 Articles and 6 annexes. Some of them are as follows

Article 2 states hazardous waste is included in Annexure I, which contains clinical waste, Pharmaceuticals, waste from wood processing, chemicals, organic solvents, cyanide, etc. This Article also mentions the characteristics of hazardous waste, which is contained in Annexure II, which include waste like Flammable gases and solids, oxidising organic peroxide, eco-toxics, infectious substances, etc.

Article 3 of this convention defines waste, which is hazardous in nature, and which contains the obligations on the part of the state parties to a convention related to hazardous wastes. Within six months of joining the convention, each state must notify the convention's Secretariat about hazardous wastes which are not included in Annex one of this convention. Any noteworthy changes to the above-mentioned information must be communicated to the Secretariat.

Article 9 of this convention discusses illegal traffic movements of hazardous waste.

Article 10 addresses inter-African collaboration, including national legislation, rules, and policies, as well as the use of safe and environmentally friendly production technologies.

Article 11 contains international and regional cooperation, multilateral and bilateral agreements regarding the cross-border movements of hazardous waste that was generated in African Countries with parties or non-parties.

Article 20 deals with settlements of disputes.

2.3.8 Oslo Protocol on Further Reduction of Sulphur Emission (1994):

On June 14, 1994, this protocol was implemented. According to this protocol, parties are encouraged to reduce sulphur emissions with proper measures. It suggests

cost-effective approaches in this regard. It contains 17 Articles and five Annexes (United Nations, 1992).

Article 1 deals with definitions such as convention, EMEP, Executive body, commission, parties, critical levels, etc.

Article 2 specifies the core requirements, namely that parties should preserve human lives from the harmful consequences of sulphur emissions. It also prescribes maintaining the emission limit as provided in Annex II.

Article 3 deals with the technology transfer and techniques to minimize the emission of sulphur through commercial exchange, contact and cooperation, industrial assistance, and exchange of information.

Article 6 deals with Research, Development and Monitoring through international cooperation, proper assessment technique, planned strategy and keeping in mind the well-being of human beings.

2.3.9 Waigani Convention (1995)

This convention discusses prohibiting the entry of radioactive, dangerous, and waste materials into the Forum Island countries. This convention's main objective is to reduce the transportation of rubbish across international borders while simultaneously regulating hazardous waste in the South Pacific jurisdictional area. It was signed in 1995 and enforced in the year 2001. The preamble of this convention highlights the following points (Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes, 1995):

- It is concerned about the practices and means adopted and enacted by the parties to the convention that hinder environmental sustainability.
- It also takes into consideration the program of action adopted in Barbados on 6th May 1994.
- It also takes into consideration the Basel Convention.
- Participants in this convention prioritize responsible handling of nuclear waste.
- This convention also recalls the Stockholm Convention (1972), Cairo Guidelines, decisions of UNEP in 1987, etc.

There are 28 Articles, and they consist of seven annexes. Some of the important Articles of this convention are enumerated below:

Article 1 is mainly concerned with the definitions, such as approved site or facility, Basel Convention, carrier, cleaner production, competent authority, convention area, disposal, domestically prohibited goods, environmentally sound management of hazardous wastes, exporting parties, Forum Island Countries, London Convention, radioactive waste, etc.

Article 2 deals with the scope and coverage of this convention. It mentions Annex 1, which contains waste that is of the Hazardous category, such as clinical waste, pharmaceutical products, mineral oil waste, etc. The area of coverage includes the region of the Pacific Ocean.

Article 4 explains the general obligations, which are as follows:

- It mentions hazardous waste and radioactive waste and their ban on import and export

- The waste covered under the jurisdiction of this convention should be reduced to a minimum level by considering technological, social and economic needs by each party.
- There is a need for coordination and cooperation for the parties who are unable to safely dispose of the hazardous waste within areas under their jurisdiction as per Article 10.

Article 7 mentions the transfer of knowledge in the event of an accident while transporting waste through the secretariat.

Article 10 states that there is a need for cooperation among parties and international cooperation.

Article 20 contains provision relating to dispute settlement on the basis of mediation, negotiation and other peaceful means.

2.3.10 Rotterdam Convention (1998):

It was implemented on 10th September 1998. It was enforced on 24 February 2004. UNEP and FAO hosted this convention. This convention came into existence due to the increased production of pesticides and chemicals, which are hazardous in nature, in the decade of 1970s. The global expansion of the chemical industry has made it challenging for many developing countries to keep an eye on the arrival and utilization of these dangerous substances. This convention initially applied to 22 pesticides and 5 industrial chemicals. At present, it applies to 35 pesticides and 16 industrial chemicals. In the decade of 1980s, the UNEP and FAO were obliged to develop and promote voluntary information exchange programs on these chemicals. The chief goals of this convention are as enumerated below:

- To promote the exchange of information about certain hazardous chemicals.
- To provide a national decision-making procedure for imports and exports.

As per Article 3 of this convention, it imposes restrictions on chemicals and several hazardous pesticide formulations (United Nations Environment Programme, n.d.).

2.3.11 European Union on Waste Management:

The European Union is very much concerned with the SWM. Reaching net-zero GHG emissions in Europe by 2050 is the main objective of the European Parliament, Council, and Commission. The various sectors of the economy covered by the European Green Deal are farming, energy, construction, biodiversity, and innovation. The said deal focuses on transforming the European economy for sustainable development based on seven parameters, such as Preservation of European natural capital, growth of a sustainable transport sector, to achieve clean, reliable, and affordable energy sector, a zero pollution Europe, preservation and restoration of ecosystem and biodiversity, a healthy and environment friendly food system and transition to a circular economy (European Parliament, n.d.). Another remarkable development of the EU in terms of sustainable development is to switch to new cars with reduced carbon emission levels. According to the information available from the European environmental agencies, new cars sold in the European market in 2021 had average carbon dioxide emissions of 115g/km. The EU intends to impose an import duty on carbon-intensive industries from non-European countries. (Pandey, 2024)

2.3.12 The Global Commitment 2022:

The Global Commitment 2022 progress report was a network of more than 1000 businesses, organizations, and governments. It was stated that the signatories to

the global commitment accounted for more than 20 percent of the packaging market of plastic. The report of the Global Commitment 2022 has three major findings. Firstly, it is stated that there was some major progress but some of the key targets set for 2025 are likely to be missed. Secondly this report focuses to reinforce the urgent need for business houses to take action for reuse, flexible packaging and decoupling business which are not meeting till date as per 2025 targets. Finally, it emphasized that states must take measures to speed development while also negotiating a legally sound instrument to combat plastic pollution. This Report which targeted 100 percent reusable, recyclable or compostable plastic packaging will be unable to attain by most of organizations because of inadequate infrastructure facilities and with a flexible packaging system.

The business organization are planning and designing their investment in such a way that their packaging will be in the form of recyclable products. It was stated by the signatories that the share of post-consumer recycled content has increased from 4.8 percent to 10 percent between 2018 and 2021. Though The majority of signatories had reduced virgin plastic use, it was noted that the collective virgin plastic use of the majority remained as it was in 2018. The report also stated that there is a need to reduce single-use plastic packaging by redesigning packages, transforming business models and introducing innovative products in the economy. The progress report also stated that 34 additional national and sub-national members will join the global commitment in the year 2022. The progress reports also mention to minimize problematic or unnecessary plastic packing. The report stated seventeen governments and 130 businesses across the plastic value chain achieved progress against the 2025 commitment. The report also stated that in order to eliminate problematic or unnecessary plastic packaging it should shift to material substitution and designing

recycling products. This progress report in formulating policy measures supports innovation in packaging, product design or new business models or use models. The report states that in order to achieve hundred percent re-usability, recyclability, or composability targets, it is necessary to take action plans in three areas such as 1. Technical recyclability 2. Flexible plastic packaging and 3. Rigid plastic packaging (Ellen MacArthur Foundation, 2022).

2.3.13 Garbage Patch and International Efforts:

The Garbage Patch is an area located in the ocean where waste is accumulated due to ocean currents. The world's five biggest garbage patches are located in the South and North Atlantic, the South and North Pacific, and the Indian Ocean. Among them the Great Pacific Garbage Patch (GPGP) is the largest in the world (National Oceanic and Atmospheric Administration, n.d.).

GPGP is a sizable region of the North Pacific Ocean that is primarily made up of microplastics and other marine trash. These microplastics originate from larger plastic items that have broken down over time, as well as various consumer products. The GPGP poses significant risks to marine life, as animals ingest these plastics, leading to harm and the introduction of toxins into the food chain.

Several global attempts have been initiated for tackling this issue, like the Ocean Cleanup Project, UNEP's trial run initiative, the United Nations Plastic Treaty of 2022, etc. Despite these efforts, the problem of technical and logistical Issues, insufficient global cooperation, and funding constraints remains a challenge to address the issue of the garbage patch

2.3.14 United Nations Plastic Treaty 2022:

The United Nations Environment Assembly (UNEA) established this treaty in 2022. Through the Intergovernmental Negotiating Committee (INC) the UNEA developed various rounds like the INC-1 in Uruguay, INC-2 in Paris, France, INC-3 in Nairobi, Kenya, INC-4 in Ottawa, Canada, and INC-5 in South Korea in the year 2024. The main objectives of these rounds of talk are the elimination of plastic pollution, enhancing recycling, and promoting the circular economy (Plastic Pollution Coalition, n.d.). However, this treaty has enforcement problems, a lack of consensus, and financial constraints.

2.4 Summary and Analysis

Although different parties have signed international environmental conventions and arrangements, there is a large disparity in their execution, particularly in terms of solid waste regulation and management.

The international conventions, treaties, laws, and protocols have failed to provide with binding legal obligation, which has led to verbal commitments without strong accountability. Secondly, it was found that the legally binding agreements of the conventions, such as Basel, Rotterdam, and the London Protocol of 1996, have suffered from enforcement gaps. As a result, developing nations are exploited due to their weak legal systems (Puckett, 2020).

Thirdly, the doctrine “prior informed consent” embedded in the Basel Convention has been condemned for its vague classification and improper monitoring mechanisms (Clapp, 2001). It can be observed from analyzing the international

environmental convention that the solid waste management domain of the international environmental laws is not specifically addressed. In addition, many aspects of waste management are not sufficiently addressed. The Brundtland Report of 1987 introduced the notion of SD. It lacks a proper roadmap for linking the environment and protection with that of economic planning and social inclusion. Similarly, the European Union's circular economy, although it deals with recycling and resource recovery but its application to developing countries remains a challenge due to economic constraints and technological dependence (European Commission, 2020).

Thus, we can conclude that the present global design of environmental conventions represents a fragmented and inefficient approach. Although the major aim of these conventions and treaties is to raise awareness and to eradicate pollution and promote sustainable practices, their application remains a constraint for achieving these long-term goals. As a result, there is an urgent need for a comprehensive international environmental strategy that specifically addresses SWM issues by integrating economic, social, and cultural practices with a global synchronized system of finance, monitoring, and compliance.

Chapter- 3

Solid Waste Management Laws in India

3.1. Introduction:

In India, to safeguard the environment and manage solid waste in a sustainable way, specific rules have been implemented. Several aspects of solid waste management are covered by the Environment Protection Act of 1986, such as the Manufacturing, Storage, and Import of Hazardous Chemicals Rules of 1989, the Manufacturing, Sale, and Uses of Recycled Plastic Rules of 1999, the Batteries (Management and Handling) Rules of 2001, the Hazardous and Other Waste (Management and Trans-Boundary Movement) Rules of 2016, the Bio Medical Waste Management Rules of 2016, the E-Waste (Management) Rules of 2016, the Solid Waste Management Rules of 2016, the Regulation of Poly chlorinated Biophenyls Order of 2016, the Regulation of Lead Contents in Household and Decorative Paints Rules of 2016, Construction and Demolition Waste Management Rules of 2016 and Plastic Waste Management Rules of 2016.

3.2 Historical Development

To understand the SWM, it is essential to evaluate the socio-economic activity in the Vedic time, the later Vedic period, in the sutras, dharma sutras, epic period, such as Ramayana and Mahabharata, Dharma shastras, Buddha period, Ashoka period, etc.

The Pre-historical period, which is also called the Pre-Harappan period, existed before 2300 B.C, and the Harappan period covers from 2300 B.C- 750 B.C. The Harappan civilization is commonly referred to as the Indus Valley Civilization. It is the early urban culture in the Indus River basin of India. The civilization is spread

in three parts such as North, South, and East. The Northern portion covers five tributary rivers of the Punjab. South includes the Indus delta, and East covers the Great Indian Desert (Thar Desert).

Before the World War II Sir John Marshal and his colleagues excavated at Mohenjo-Daro and Harappa and Chanhu-Daro. The important sites which were excavated were Kalibanga, Dabar kot in the Roralai of Northern Baluchistan; Amri, Chanhu-Daro and Judeirjo- Daro in Sindh, Sandhanawala in Bahawalpur and Rupar in the Punjab (Wolpert, p.16,2000)

The resources of Vedic economics comprise natural resources, agricultural resources, and industrial activities. Land and labour are considered important factors of production. Rig Veda mentions that all labourers are equal, but the contribution of value of labour differs (Acharya, 2005, p. 205). In the Vedic period, three types of exchange are mentioned such as the Barter system, cows as a medium of exchange, and the use of coins. The industries that were found in the Vedic period are blacksmithing, laundryman, charioteering, weaving, carpentry, rope making, bow making, jewellery, cloth industry, tannery, iron industry, weapon industry, pottery, etc. Since there was limited growth of industries, and at the same time, there was a limited trade pattern, as a result of which there was less possibility of a management of waste in the Vedic age. One of the most significant ecological records from India's Vedic era was the Prithvi Sukta. Prithvi Sukta of Artha Veda mentions universal order (rita), creative fervour (tapas), and spiritual exaltation (brahma). It mentions seas, rivers, water, space, mountain heights, creatures, rocks, sources of livelihood, material wealth, forests, animals, wild animals, etc. It also provides information about Gandharvas, Aryas, Apsaras, Piscas, and Rakshasa (demons). It also contains agni,

surya, sakra (Indra), Vritra (Earth), and Visvakarman (creator of all) (Gupta, 2010, pp. 29–39).

The religious works such as Yajur Veda, Sama Veda, Artha Veda, the Brahmanas, the Aranyakas, and Upanishads provide important information about economic activities in the later Vedic period (Tripathi, 2014, p.41). During this period, several types of food crops were grown, such as barley (Yava), Rice (Vrihi), Beans, Sesamum (tili), wheat (Godhuma), etc. The main occupational pattern of the later Vedic period were Chariot making, basket makers, hunters, fisherman, rope makers, basket makers, musicians, fire rangers, cooks, professional acrobats, dyeing embroidery, basket making etc. (Tripathi, 2014, p.50). In the Artha Veda, it was mentioned that people have knowledge of forest life; they also knew the types of plants and trees. (Gupta,2010).

Ancient writings like Manu-smriti and Arthashastra advocated for the sorting of trash into organic and inorganic forms and offered precise guidelines for disposing of waste. Non-organic materials, especially metals, were frequently recycled or reused, while organic trash was frequently composted and used as fertilizer in agricultural techniques (Gupta,2010). Modern drainage systems, such as those seen at Mohenjo-Daro and Harappa, effectively controlled wastewater, limiting the accumulation of trash and guaranteeing public hygiene. Overall, sustainability principles governed solid waste management techniques in ancient India, with an emphasis on minimizing environmental effect and promoting a circular economy, a notion that was ingrained in the culture long before it was acknowledged as a universal truth (Doniger,2015).

The Ramayana is composed from 200 BCE to 200 CE. The great Indian sage Valmiki composed the Ramayan. It is a Brahmanical book. During the period of

Ramayana, the urban civilization was in a great height. In this period, there was mention of architects. It also stated about Vishwakarma, Manu and Maya. The city was protected by strong walls. Forts were the places where wealth, grains and weapons were kept. In Ramayan period the Nation was divided into Pur and Janpad. The people residing in Janpad were known as Janpada. Gram was divided into three units Gram, Mahagram and Goshgram (Vyas, 1987, p. 117). The national economy of this period comprises of cattle breeding, agricultural sector and trade. Land was irrigated through tanks, wells, cannels and dams. The industries which flourished during Ramanaya period were Textile industry, Goldsmith, Dhatu (metal), leather etc., (Panda, 2018, p. 40).

The Balmiki Ramayana in its Aranya Kanda mentions the forest of Panchavati. During this time, they constructed a Kuti (hut) which was made of timber, leaves, wild grass, etc. Balmiki highlights in Kiskinda, kanda that there was Pampa Lake which contained lotus flowers and fishes. The lake also contained numerous species of flowers and trees. Wild animals such as Deer, Snakes, Birds, and carnivorous animals were also found. People in the Ramayana period lived in harmony with nature. They reused waste, kept their water clean, and took care of forests and animals. Cities were planned well, and farming was done without harming the land. Planting trees was seen as a good deed, and nature was treated with respect. Thus, sustainable waste management was practiced during that period (Valmiki, 2007).

The two important cities of the Mahabharata were Hastinapur and Indraprastha. Santi Parva described the Gana form of Government, which means it was ruled by many. The administration was run by a Mantri Parisad. The whole administrative region of the kingdom was divided into two parts, that is, Nagar (town)

and grama (village) units. The majority of the population lived in villages near forts. They reared cattle and practised agriculture (Tripathi,2014, p.72). It was believed that the plantation of trees and their protection provided heavenly blessings to its citizens because there was a belief system that the Gods and Goddesses preferred to live in trees, rocks, and forests.

Bhagavad Gita, which is a part of the Mahabharata, states that Lord Krishna provided spiritual knowledge to Arjuna. It laid the foundation of 'Dharma', which means truth and non-violence (Nehru,1993, p.107). The epic describes a harmony between nature and the human environment. It believes in the concept of Vasudhaiva Kutumbakam, that is, the universe is family (Nehru,1993)

During the Mughal Empire (1526-1707), there was a well-planned waste management system. The Chandni Chowk Market in Shahjahanabad (now in Old Delhi) was planned during the Mughal period. It started from the Red Fort and extended westwards to the Lahore Gate. There were shops on both sides of the street, which indicates the commercialisation of the place. There was a water canal that passed through the middle of the street, which was reconstructed by Ali Mardan Khan. The Jamna River served as the canal's principal supply of water. Water for consumption in the city was supplied either from wells or the Jamuna River. Water was collected from the river by using Persian Wheels, or it flowed through gravity-fed canals. The organic or biodegradable waste was carried away in drains or sewers. Animal and human waste were collected and applied as manure in the nearby market gardens. There was a reuse of waste for agricultural purposes without polluting the natural environment. It was found that in the Mughal era, there was a sustainable, well-planned urban infrastructure development mechanism (Fisher, 2018).

During the 18th and 19th centuries, British India saw substantial advancements in managing waste in India. There was a shift from indigenous communal practices to colonial sanitation mechanisms. Before the British arrived, the waste disposal system was primarily decentralized, and garbage was mostly biodegradable.

The main objective of the East India Company was profit maximization and revenue collection, thereby ignoring the environmental development of India. Deforestation for the purpose of urbanization was at its peak (Fisher, 2018). The waste management during the British era was poor, as the British government did not take sufficient measures to provide basic sanitation facilities to the Indian population. Places like Calcutta, Bombay, Ahmadabad, etc., do not have proper management of waste. In Calcutta, the streets where the slum population was situated were congested; there was no space to walk, and the houses lacked proper drainage facilities, resulting in odor and pollution. The leaked sewage water was responsible for carrying solid waste and creating liquid, solid, and air pollution. As per the Medical Report from 1869, the city lacked planned solid waste management, as the streets were filled with garbage and human waste. The drainage was not cleaned regularly, causing a health hazard. However, the situation was different where the British officials lived. The area where the British official lived was clean, and hygiene was maintained. There lies an unfair advantage when the standards of hygiene were made between the Indian population with that of the British population (Schenk, 2021).

Even in Bombay housing areas, the sanitation facility was ignored. The establishment of mills and factories led to overcrowding. The areas which were known as 'Chawls' lacked toilet and tap water facilities. As per the Government Report of 1939, overcrowding was an important problem for the purpose of sanitation.

It stated that 20 people are living in a single room in Bombay. Although efforts were made to improve the urban planning in Bombay, like the Bombay Improvement Trust of 1989 aimed to clean slums and develop better housing, the trust stressed more on buying land and selling it for profit rather than providing clean sanitation facilities. Thus, the Solid was management during the British period was poorly planned and neglected. The major problems at that time were overcrowding, sanitation, the growth of slum population, manual cleaning of waste by scavengers and discrimination between the Indian versus the British population, and a lack of government efforts (Schenk, 2021).

Indian Environmental laws are derived from the British fragmented regulations, and in the post-independence period, they became comprehensive legislation. The laws that were enacted in the British Era, such as the Shore Nuisance Act, 1853, the Fisheries Act, 1897, and the Smoke Nuisance Acts (1905, 1912), were mainly concerned with the local pollution issues. However, the 1912 Wild Birds and Animals Protection Act provided minimal safeguards to wildlife protection. The International Conference of Stockholm 1972 became the turning point for setting up environmental consciousness in India. Consequently, the Parliament enacted several laws, such as the Wildlife Protection Act of 1972, the Water Act of 1974, the Forest Conservation Act of 1980, and the Air Act of 1981. Following the Bhopal Gas Incident, the Government of India enacted the Environment Protection Act of 1986, which is considered the controlling legislation for handling various pollution and waste management issues. (Shedge, 2024).

The GoI has created a cleanliness program and waste management strategy, in addition to environmental laws. 1986 saw the launch of the Central Rural Sanitation Programme (CRSP). Its primary focus at the time was on funding allocation and toilet

construction, but no emphasis was given to behaviour change. This programme was proven to be insufficient and therefore it didn't achieve its desired goal. The GoI started another initiative in 1999 called the Total Sanitation Campaign (TSC) to provide "sanitation for all" by the year 2012. However, this campaign too failed, and there was no improvement in the lives of the people in India. This TSC was renamed as Nirmal Bharat Abhiyan in the year 2013, and later it was relaunched as Swachh Bharat Mission (SBM) in the year 2014. By analysing the objective of the SBM, we find that there are two objectives: firstly, the immediate objective and secondly, the intermediate objective (Kedia, 2022). In its immediate objective, the main goal was to make India defecation-free, and the second objective is to promote sustainable behaviors.

To a certain extent, the SBM is successful in achieving improvement of public health, enhancing environmental sustainability in certain cities like Indore, and promoting socio-economic development, providing a cleaner environment, targeting behavioural change, etc. However, despite these positive achievements, the SWM is facing numerous hurdles like inadequate infrastructure, financial constraints, behavioural barriers, and regulatory flaws. Although numerous funds were released for urban and rural sanitation, the Standing Committee on Rural Development 2018 said that the Ministry's assertions were simply on paper and not in actual practice. A study conducted in four states shows that although the establishment of rural latrines has increased still open defecation remains a problem. Although funds were allocated for the construction of rural and urban latrines but the fund falls short, not covering the expenses of latrine construction (Kedia, 2022).

3.3 The Environment Protection Act, 1986:

Historical Background: The country's pollution levels increased during the 1980s, owing primarily to deforestation and urbanization. As a result which there was a reduction in the environmental quality, resulting in a loss of biological diversity. In the 1980s, the Tiwari committee published a report stating that the majority of India's environmental legislation was out of date due to a lack of sound policy objectives, insufficient implementation machinery, a lack of appropriate scrutiny procedures, etc.

As a result, the committee suggested that new legislation be enacted to address the existing environmental issues (Ahmad, 2001). Although at that time the Air and Water Acts were there but India still lacks a comprehensive framework to cater to all the needs of environmental protection. India was a member of the Stockholm Conference in 1972. Therefore, it compelled the Government of India to frame environmental laws to align with the provisions of this conference. In 1984 there was a Gas leak disaster took place in Bhopal, which is considered one of the worst disasters at the international level, resulting in long-term health effects and loss of life, sparking the need for comprehensive legislation. The Environmental Protection Act was passed on May 23, 1986, and took effect on November 19, 1986. This Act applies to the entire nation. The following are the main portions of this Act:

Section 2 of the Act deals with the definition clause, where it defines the meaning of Environment, Environmental pollutants, Environmental pollution, handling, occupier, and prescribed.

Section 3 concerns the Central Government's (CG) ability to take required actions to safeguard the environment. The authority of the CG includes planning and implementation related to public awareness; laying down standards relating to quality, discharge, hazardous substances; inspecting premises, manufacturing, setting up environmental laboratories and authorities; collection preparation, etc.

Section 5 gives the CG the authority to provide orders about the ban, closure, or monitoring of industrial units, as well as the interruption or control of electricity, water supply, etc.

Section 6 addresses the CG's ability to standardise quality.

of air, water soil, minimise environmental pollution, measures for tackling hazardous substances, restrict industries and prevent accidents.

Section 7 restricts any person who is running an industry from emitting environmental pollutants beyond their limit.

Section 8 talks about following the proper safeguards as per the prescribed procedure.

Section 9 deals with information relating to excess discharge

Section 10 empowers any person to discharge the function relating to testing, examining, planning, recording equipment and documents.

Section 11 states that the Central Government or an authorised official can collect specimens of soil, water, air, or other materials from different locations for analysis, using specified procedures. The analysis results are admissible in court only if specific steps are followed: notifying the responsible person, collecting the sample in their presence, sealing and labelling the container with both parties' signatures, and promptly sending it to an accredited lab. If the responsible person is absent or refuses to sign, the sample is still taken, signed by the official, sent to the lab, and the situation is reported to the Government Analyst.

Section 12: This section talks about the establishment of one or more environmental laboratories as per the direction from the CG.

Section 13 states that the government analyst may be appointed for examination of the sample collected, such as a sample of air, water, soil, etc., as per the direction of the Central Government.

Section 14 mentions that the samples which are examined by the government analyst can be used for the purpose of evidence in court.

Section 15 deals with the punishment provision for not following the Environment Protection Act. The punishment is 5 years in prison, a Rs 1,00,000 fine, or both; if the offense continues, it will be increased to Rs 5000 each day.

Section 19 prohibits the judiciary from adopting cognizance of the offence except a complaint is filed by the CG or an authority authorized in this regard.

Section 22 limits the court's ability to accept any provisions found in this Act unless the CG gives an order or directive.

Section 24 deals with the inconsistency of provisions between this Act and any other Act. It states that during such inconsistency of punishment, the other act provision will prevail over this Act.

3.4 Manufacture, storage and import of hazardous Chemicals Rules 1989

These Rules were published on 27th November 1989. These Rules have defined 14 definitions, some of which are exporter, hazardous chemicals, major accident, etc.

The term 'exporter' means the exporting country that generally exports hazardous chemicals.

Rule 3: The duties of the authority include inspection once a year of the industrial activity.

Rule 4: It is the obligation of the occupier to assure that no accident takes place during industrial activity.

Rule 5: It is the duty and responsibility of the occupier to report to the concerned authority about the accident.

Rule 7: An occupier shall not carry out any activity unless the occupier gets approval and notification of the site from the concerned authority.

Rule 8: Where the particulars of a specified report are affected due to a change made by the occupier relating to quantity, quality of hazardous chemicals, etc., then the occupier shall further have to submit the report to the authority appointed for this purpose.

Rule 11 states that a safety report should be prepared for the industrial activity under Rule 10 for new technological knowledge.

Rule 12: After examining the audit and safety report, the authority concerned may ask for additional information within 90 days.

Rule 14: The concerned authority has to prepare an emergency plan both for new industrial activity as well as existing industrial activity.

Rule 18 states that the person importing hazardous chemicals should inform the concerned authority about the date of import.

Rule 19: If the provisions of these Rules are violated by any person, then the concerned person shall direct that person to improve by providing him a notice.

Rule 20: The Central Government can modify the Schedule of these Rules by gazette notification.

3.5 The Recycled Plastic Manufacture, Sale and Uses Rules, 1999;

The features of these Rules are as follows:

Rule 4 States that no person shall either produce or sell bags which are constructed from new or recycled plastic, each under size less than 8 x 12 inches as per Rule 8. Vendors are not permitted to use containers/bags constructed from reprocessed plastic for packaging or carrying foodstuffs.

Rule 5 states that the containers and carry bags made out of non-recycled plastic should be made either in a natural tone or white.

Rule 6 states that BIS is tasked with the Recycling of Plastics.

Rule 8 prescribes that plastic, whether recycled or non-recycled, shall in thickness must have a thickness of more than 20 microns.

Rule 9 states that self-regulatory measures will be carried out by the Plastic Industry Association by their member units.

Rule 10: CPCB or the State Board shall not renew a registration certificate unless it meets the prescribed norms. The registration shall remain valid for three years.

3.6 The Batteries (Management and Handling) Rules 2001

There are 19 definitions defined in these Rules, some of which are battery, dealer, State Board, and used Batteries. The term ‘battery’ implies a lead-acid battery.

A dealer may be defined as a person who directly deals with the sale and purchase of lead-acid batteries. The term ‘used battery’ refers to damaged and old lead-acid batteries and their components.

Rule 5 CBCB will provide registration. The registration shall be cancelled in case of non-collection or delay, or non-submission.

Rule 6: The clearance through customs is done with proper registration with the RBI. It is also necessary to go for undertaking in Form III and to fill out the return in Form IV.

Rule 7 includes the collection of used batteries by the dealers, providing an appropriate discount for used batteries, safe transportation and preventing damage to the environment.

Rule 10 obligated the consumers to deposit batteries which are already used to manufacturers, dealers, importers, etc.

3.7 Comparison between the Batteries (Management and Handling) Rules, 2001 and the Battery Waste Management Rules, 2022.

The new Rules of 2022 (Rule 2(1)(ii)) apply to all kinds of batteries irrespective of shape, volume, weight, composition, etc., whereas the earlier Rules of 2001 were limited to lead acid batteries. In the new Rules of 2022 that is Rule 3(x) and 3(y) talk about the Refurbishment for used batteries and their function; however, the earlier Rules only mentioned re-conditioning for repair or sale, etc, but not for the second life of the batteries. Rule 14(4) of the revised Rules talks about recycling, then incorporating it into new products. These Rules of 2022 also added the principle of environmental compensation for violations through Rule 13. The 2022 Rules in Rule number 10 also provide for the certificate for waste battery, which was missing in the earlier Rules. A centralised online portal for compliance is also added in these new Rules of 2022 (Rule 14).

Although these new Rules tried to mitigate the gaps of the 2001 Rules however implementation and integrating the waste pickers into the formal sector remain a challenge.

3.8 Hazardous and other waste (Management and Transboundary Movement) Rules 2016;

It shall not be applicable to waste generated by ships, wastewater and exhaust gases, solid waste generated by municipal areas, or waste generated by radioactive and biomedical materials. These Rules 3 contain 40 definitions, some of which are as follows:

Hazardous waste may be defined as that waste which causes danger to health as well as the environment.

Rule 4 outlines that the occupier must take seven procedures, such as utilise, reuse, prevent, minimise, recycle, recover and proper disposal.

Rule 7: The State Board has the authority to cancel or suspend the authorisation when the question of public interest arises.

Rule 8: The occupier has the power to store the hazardous and other waste for 90 days.

Rule 9: It is necessary to obtain authorisation from the SPCB to utilise this hazardous waste as a resource.

Rule 10: The MoEFCC or the CPCB will offer a SOP for the environmentally friendly handling of waste that is hazardous in nature.

Rule 11: For Imports and exports of hazardous waste, the MoEFCC shall become the nodal agency.

Rule 15 states that the permission of CG is crucial for the trade of hazardous waste within India.

Rule 17: The occupier shall handle hazardous waste with proper packaging and labelling as directed by the CPCB.

Rule 20: The occupier or operator shall maintain records and returns about hazardous waste in Form III.

Section 21: It is the Responsibility of the authority to perform as per the provisions of Schedule VIII

3.9 The Bio Medical Waste Management Rules 2016;

These regulations apply to facilities that produce and manage biomedical waste. . These rules are not applicable in case of hazardous chemicals, radioactive

waste, lead and batteries, e-waste, etc. Some of the important Rules are enumerated below:

Rules 4 states that the occupier has to handle bio-medical waste properly so that it does not cause any environmental hazard. The occupier also must segregate the bio-medical waste properly in colour bags or containers within the premises, which should be safe and properly ventilated, and without overflow of the waste here and there as per the provisions contained in Schedule I. There should not be any intermixing of solid waste with bio-medical waste, and they should be treated separately. The occupier must provide training to workers who are engaged in healthcare, and at the same time to provide details of the training in the annual report. Every occupier must immunise all the healthcare workers from Hepatitis B and Tetanus diseases. It is important to set up a barcode system for bags and containers which are holding bio-medical waste. Every occupier has to provide a health checkup to the workers once a year. It is necessary to keep the register updated daily and at the same time update its data on the websites. Every occupier should maintain accident records that occur due to blast or fire hazards while handling bio-medical waste. It is necessary to mention in its annual report, published on the website, regarding healthcare facilities. The designated authority must be notified as soon as feasible if biomedical waste is not collected within the allotted time. With the assistance of a committee, biomedical waste management mechanisms must be reviewed and monitored within six months.

It is necessary to keep a record for five years regarding the operation of incineration, hydro, or autoclaving, etc.

Rule 5 The operator has seventeen responsibilities, some of which are as follows:

- Establish a GPS system for garbage management.
- The occupier who negligently handles segregated waste should report immediately to the prescribed authority.
- It is necessary to provide at least one year of training to workers before their induction in the case of handling biomedical waste.
- Operators are also assigned the duty that workers should be medically examined at the time of induction.
- The operator must report the accident as per the procedure contained in Form 1 to the prescribed authority.
- Every operator must maintain log logbook for maintaining medical equipment.
- The operator has to check if the waste treatment is done properly or not.
- The operator also has to display their activities in the annual report as well as on their websites.

Rule 7 states eleven criteria for treating and disposing of bio-medical waste.

Some of them are as follows.

- Treatment and disposal of BMW should be done as per Schedule I by the operator.
- Handling of segregated waste should be done as per Schedule I by the occupier.
- No occupier shall use the chlorinated plastic bags for the storage and transportation of BMW.

- A proper record should be maintained either by the occupier or operator concerning recyclable waste.
- Lead and mercury waste should be handled and removed as per their prescribed rules and regulations.

Rule 8 outlines eight criteria for sorting, wrapping, packaging, movement and storage of BMW. Some of them are as follows:

- As per the provision of Schedule IV, labelling should be done on the container or bags.
- It is essential that bio-medical waste, soil waste, anatomical waste, etc., should not be stored for more than 48 hours.

Rule 14: It is necessary to maintain records for Five Years by the Concerned authority who are handling biomedical waste.

Rule 15: It is the obligation on the part of the authorised person to inform the prescribed authority regarding the accident report within a time frame of 24 hours.

3.10 The E-Waste (Management) Rules 2016;

These are 36 definitions of these Rules. It defines 'E-Waste' as rejected waste by the consumer, manufacturer, or repair unit, which can include both electronics and electronic apparatus.

Rule 5 The producer has the following responsibility :

- It must collect and channelise the e-waste
- It shall adopt a pre-treatment process to stop mercury for disposed of in the treatment and disposal unit.

- It is the producer's responsibility to create awareness through mass media, advertising, and other means.

Rule 7: Dealer is authorized to safely transport E-waste to authorized recyclers.

Rule 8: The refurbisher shall gather e-waste created during refurbishing it has the following duties:

- To make an application as per the given Rules to the SBCB concerned, and thereafter the SBCB will grant authorisation within 30 days and thereafter the refurbisher is responsible for submitting yearly details about the waste generated to the SPCB.
- Ensure no environmental damage took place during the transfer of waste from one place to another.
- Refurbisher should properly maintain records.

Rule 9 assigns the duty to the consumer to properly channelize the E-waste, E-waste record maintenance, and no mixing of expired e-waste with that of e-waste containing radioactive substances.

Rule 11: There are 11 parameters of the recycler. These are (i) acceptance of the guidelines of the CPCB, (ii) obtaining guidelines from the SPCB, (iii) preventing environmental damage, (iv) sustainable recycling process, (v) providing records to either SPCB or CPCB, (vi) Sending of non-recyclable materials to the recycler so authorised, (vii) proper disposal of residue, (viii) proper maintenance of e-waste record, (ix) filing annual return, (x) avoidance of radioactive materials in recycling process and (xi) no operation without authorisation.

Rule 12: The State Government authorises either the Department of Labour or any government agency for registration of workers, group formation of workers, training of workers in skill development, and annual monitoring.

Rule 13 states that the procedure for requesting and granting approval depends on the following conditions:

- The CPCB has the right to reject the grant provided by the EPR Authorisation
- The producer may lose their right to put electronic and electric equipment on the market in the event of refusal by the CPCB.
- It is the duty and responsibility of the CPCB to forward the EPR plan to the SPCB to supervise it.
- It is necessary to fill out the Application in Form 1(aa) to the CPCB before 120 days to renew the EPRA.
- Every producer has to fulfil the conditions specified in the EPRA.
- The SPCB has to monitor the implementation of EPRA.
- The CPCB has the right to cancel or suspend the EPRA if, in its random check, it is found that holders do not comply with the Authorisation process.
- It is necessary to maintain online registration of EPRA by CPCB.
- The SPCB shall provide authorisation to the manufacturer for generating e-waste.
- It is necessary to make an application for authorisation by the manufacturer within 90 days.
- The SPCB has the right to reject the authorisation given to the manufacturer.

Some of the procedures for granting authorisation to a dismantler or recycler are as follows:

- Approval from the SPCB, registration, and proof for installation from the district industries, and for the purpose, renewal approval is required from the SPCB.

Rule 17. It is stated in the Rule that authorities shall perform the duties according to Schedule IV.

Rule 19: The transporter has to take a document that is prepared by the sender in the format given in Form 6.

Rule 20: It is the duty and responsibility of the producer, transporter, or recycler to report the accident to the SPCB.

Rule 21: The liability for environmental damage shall fall on the manufacturer, producer, etc.

3.11 Comparison between E-Waste (Management) Rules, 2016 and the E-Waste (Management) Rules, 2022.

The new Rule of 2022 added the Centralised Digital Portal for registration, return, maintaining records, collection, etc. The 2022 Rules state that registration in the online portal is mandatory for all manufacturers, refurbishers, recyclers, etc. In the earlier Rule, there was no concept of EPR certification; however, in the new Rules, that is, Rules 14 and 15, provide a detailed description of how these certificates are created and used.

In the earlier 2016 Rules, the target was proposed and CPCB approved (Rule 13(1)(ii)). In the new Rule, the targets are fixed as per the Schedule III and Schedule IV and are government-mandated (Rule 6(2)). Earlier, there was no concept of a Steering committee, which is included in Rule 25 of the new 2022 Rules, to look after

the implementation, resolve disputes and adapt the new rules and technology. Rule 22 of the 2022 Rules provides for the environmental compensation, which is more detailed than the 2016 Rules. Although the new Rules try to minimise the gap of the 2016 Rules, the problem of implementation failure is still a challenge in India this is due to the consumer engagement gap, lack of awareness. For example, the brands often fail to make a take-back system for easy and convenient handling of e-waste.

3.12 The Solid Waste Management Rules 2016

This Rule was published on 8th April 2016. This Rule applies to Urban Local bodies (ULB), census towns, railway land, notified Industrial towns, airports and air bases, areas related to pilgrims, religious sites, ports, harbours, and historical places etc. These rules define 58 terminologies, but only 4 terminologies are discussed in this analysis below:

- The term ‘Dry Waste’ refers to recyclable and non-recyclable waste, sanitary napkins, combustible waste, etc.
- Dumping sites are defined as the places where local bodies are entitled to dispose of solid waste. They do not follow the principles of sanitary landfilling.
- The term ‘non-biodegradable waste’ may be defined as that type of waste which is resistant to microbial breakdown
- The term ‘Waste Generator’ applies to those persons who generate solid waste, such as residential premises and non-residential premises.

Rule 4 of the aforesaid Rules there are eight duties of a waste generator, they are as follows:

- Each trash generator must segregate and store their waste in three different bins, namely domestic hazardous waste, biodegradable waste, and non-biodegradable waste.
- The wrapper or the pouches supplied by the brand owner or manufacturer can be used for wrapping the sanitary waste properly and shall be disposed of in the dry bin or non-biodegradable bins. These rules prohibit open burning, disposing of solid waste other than on their premises, including drains and other water bodies.
- The solid waste generator shall pay the user fee per the bylaws of the local bodies.
- Prior consultation of at least three days with the local bodies is required to hold a function or event involving over 100 people in a location that is not licensed.
- To guarantee that waste is separated at its origin, all resident welfare and market groups must work with local authorities within a year of the guidelines' announcement. They should aid in collecting separated waste. As per the direction of local authorities, the waste that is residual in nature should be handed over to designated agencies.
- All private residential communities and establishments with over 5,000 square meters must, within 12 months of the announcement of these Rules, coordinate with local authorities.
- The hotel and restaurant owners have the responsibility to segregate waste at the origin.

Rule 5: It is the duty of the MoEFCC to supervise and execute the said rules laid down in the country. Additionally, a central monitoring committee will be established by the ministry and led by the secretary of the relevant department. The said committee will meet at least once a year.

Rule 9 states that the Ministry of Power has to decide the tariff for electricity produced from waste materials, and at the same time, they have to purchase power generated from such waste.

Rule 14 The CPCB has the right to monitor whether these rules are implemented properly or not by local bodies with the help of State Boards.

Rule 15 specifies that, in accordance with state policy, panchayats and local bodies must create a solid waste management strategy.

Rule 16: The SPCB is in charge of making sure that the Solid Waste Management Rules are followed in their state by local groups that they govern.

Rule 17: Manufacturer or brand owner is accountable for giving the local government financial support to implement an appropriate waste management system.

Rule 20 states that the construction of landfills in hilly areas for establishing Solid Waste Management Units shall be avoided.

Rule 22 states the need to set up solid waste processing units within one year.

Rules 23: Establishment of the state-level advisory board consisting of one chairman and sixteen members.

3.13 The Construction and Demolition Waste Management Rules 2016;

All trash produced during the building, remodeling, repairing, and demolishing of any civil structure is subject to these regulations. This includes

waste generated by individuals, organizations, or authorities, and encompasses building materials, debris, and rubble.

Section 3 (b) of these Rules defines construction as the process of constructing buildings or other facilities, as well as infrastructure development, including any modifications to these structures.

Section 3(e) defines demolition as the use of a manual or mechanical process to break or tear down buildings and other structures. It also involves the use of explosives if required in the process of tearing or breaking down.

Section 4 deals with the waste generator duties. These are:

- The waste generator shall not mix other waste with the demolition waste and construction waste.
- Waste generator who are responsible for generating 20 tons or more than 200 tons per project should segregate their waste into four different types of containers and get their plan approved by the local authority.
- They must keep their generated waste in their premise and confirm that there is no scattering of the waste in the public area.
- They must pay an adequate amount to the authority concerned, directed by the state government, for waste collection, transportation, processing, etc.

Section 6 Duties of local authorities are as follows:

- It directs proper handling of both demolition and construction waste.
- Duty to keep track of the waste generated on the construction site.
- Taking expert opinion relating to recycling, processing facilities, etc.
- Educating, informing about the construction and demolition waste with collaborative efforts.

Section 8 deals with the obligations of the SPCB, CBCB, and Pollution Control Committee.

Rule 10: The CPCB must prepare functional guidelines for the proper environmental arrangement of construction and demolition waste. It will forward the annual compliance report received from the State Board to the central government each financial year.

Rule 11 specific practice relating to the construction of roads will be governed by the Indian Road Congress.

3.14 The Plastic Waste Management Rules 2016;

Some definitions of these Rules are as follows:

- Compostable plastic is a type of plastic that breaks down through natural biological processes when composted.
- Energy Recovery means utilizing usable energy from waste plastic materials for generating electricity, heat, etc.
- Plastic means any material that contains a high polymer as an important ingredient.
- Plastic waste means those plastics that are discarded.

Rule 4 states that any person who is using plastic items like carry bags, containers, etc, should undergo the following conditions:

- In case of storing food stuffs, Pharmaceuticals, and drinking water shouldn't contain any colour or the colour should be in the natural shade and should comply with the requirements as per the Indian standard: IS 9833:198.
- Plastic used for Multilayer packaging or packaging or used to wrap any commodity should not be less than 50 microns.

- There shall not be any sale of plastic raw materials unless a valid registration is obtained from the SPCB.
- No plastic should be used for storing gutkha, pan masala, or tobacco.
- to recycle the plastic waste, one has to follow the Indian standard: IS 14534:1998.
- The thickness criteria that are not less than 50 microns shall not be applied on the plastic which are compostable.

Rule 5: Duty of the ULB are as follows:

- Properly channelized the recycled waste to the authorised waste recycler and acted according to the Indian standard: IS 14534:1998.
- Duty to dispose of thermoset plastic waste and follow the guidelines given by the CPCB.

Rule 6: The duties assigned to the Local Bodies are mentioned below:

- It is responsible for setting up infrastructural facilities for the accumulation, sorting, and keeping of waste, etc.
- Raising awareness among the stakeholders.

Rule 8 :The generator of waste must pay the necessary fees as per the local bylaws of the particular state. If any event or function is conducted in an open space, then the person responsible for creating the waste has a responsibility to properly segregate the waste.

Rule 9: The manufacturer, importer, or owner of the brand has a responsibility to:

- Collaborate with the State Urban Development Department within 6 months. This can be done by the individuals or through joint efforts of

the distribution channels or any other local body authorised in this behalf.

- Manage plastic waste by setting up a system to collect the multi-layered packets, pouches, etc, which have already been used and submitting the collection plan to the SPCB for their approval. Also, the existing companies or the agencies of such pouches, packets, etc must comply with the rules within 1 year from their notification.
- A deadline of six months has been provided from the publication of these Rules for using plastic packaging without registration from the appropriate SPCB.
- To properly keep the record of the Raw Material Suppliers of the Plastic Waste.

Rule 11: The following information should be printed in every carry bag or multi-layer packaging:

- Certification Number of the compostable carry bags.
- Label of “recycled” in case of recycled carry bags.

Rule 12: The authority of enforcement in matters related to registration, manufacturing, multi-layer packaging, disposal, and processing of plastic waste is vested in the SPCB or PCC.

Rule 13: The registration process for manufacturers, producers, and recyclers of plastic bags or multi-layered packaging involves obtaining approval from the relevant SPCB or PCC. All entities must apply for registration using specified forms and meet specific criteria, including possessing necessary consents under environmental laws and having action plans for plastic waste management. The SPCB/PCC is required to decide on registration applications within 90 days and

grants initial registrations for one year, with subsequent renewals for three years. Renewal applications must be submitted at least 120 days before the registration expires, and any revocation or suspension of registration must include a hearing opportunity.

3.15 Regulation of Polychlorinated Biphenyls Order 2016;

The salient features are as follows:

- States that in India, the import and manufacture of Polychlorinated Biphenyls are banned, from which this order is issued.
- This order states that in India, the import of equipment that contains Polychlorinated Biphenyls is banned.
- Complete prohibition of the use of Polychlorinated Biphenyls in all forms.
- It states that the Polychlorinated Biphenyls, which are permitted, shall be maintained properly without possibility of any escape or any environmental damage.
- It enumerates the duty on the part of the occupier to take necessary precautions relating to Polychlorinated Biphenyls, such as not to directly discharge them on land, the use of Polychlorinated Biphenyls contained or contaminated, etc.

3.16 The Regulation of Lead Contents in Household and Decorative Paints Rules 2016.

In this Rule, the term “Household and Decorative paints” means those paints which are used in the interior or exterior of the building, civil structure, etc.,

Rule 4 states that proper labelling of Household and Decorative paints.

Rule 7 enumerates that within six months, the testing and compliance procedure should be followed as per the direction of the Central Board with the help of certification agencies.

Rule 8: Household and decorative paints that were made or imported before these rules came into effect can still be sold for up to two years after the rules begin.

Rule 9 states that, from the effective date of the rules, all manufacturers and importers of Household and Decorative Paints must comply with lead content regulations. Each year, they are required to test their products for lead content, as specified in rule 3, using an authorized agency listed in rule 6, before these products can be marketed. The testing agencies are responsible for submitting the test reports to the nodal agency, which will verify the results and take any necessary actions.

3.17 National Green Tribunal Act, 2010

This Act was created to support the interpretation of Article 21 of COI and to put into effect the decisions made at the UNCED and UNCHE. The Definition Section contains the meaning of some of the important terms like environment, Expert members, handling, Hazardous substances, etc. The term Environment means the interrelationship that exists between living beings with the environmental resources like air, water, soil, etc.

Section 4 stipulates the establishment of members. The Full-Time Chairman, Judicial Members, Expert Members, and others will be among the members.

Section 5 deals with the qualification of the members.

Section 12: The nature and the types of officers who will help in the settling of disputes shall be determined by the Union Government.

Section 14 pertains to the tribunal's jurisdictional power. The NGT shall have civil jurisdiction which involves a sustainable question relating to the environmental domain. The application to the tribunal shall be made within 6 months of the cause of action arising. Further, this section extends this filing of application to an additional period of 60 days if there arises a reasonable ground.

Section 15 provides for compensation for violations made under Schedule I, property damage, environmental area, or area violations. The limitation period for applying is five years additional six 6 months shall be provided to these five years if there arises a reasonable ground.

Section 16 : The EPA 1986 will fall within the appellate jurisdiction of the NGT.

Section 17 specifies that the responsible party must provide compensation as decided by the Tribunal in cases when an unanticipated incident or the detrimental action of an activity results in death, injury, or harm to assets or the ecosystem.

This applies to activities listed in Schedule I. If the harm cannot be linked to a single activity but results from multiple activities, the Tribunal can divide the responsibility for compensation among those involved in a fair manner. In accidents, the Tribunal follows a no-fault principle, meaning compensation is required regardless of proving fault.

Section 19 declares that the natural justice principle shall be the basis for the tribunal's decision-making.

Section 20 emphasizes the application of three crucial principles—the Polluter Pays Principle, the Precautionary Principle, and Sustainable Development—when issuing orders or making decisions.

Section 23: This section states that in case of a false and vexatious claim, the tribunal has the power to decide the cost of loss incurred by the party.

Section 24 deals with compensation for environmental damage, which is credited to the Environmental Relief Fund. The funds in this Relief Fund can be used by authorized individuals or authorities for various environmental purposes, as prescribed by the rules, even if those purposes aren't explicitly mentioned in the Act.

Section 26: The penalties for violating NGT instructions are provided in this section.

Section 29 provides that any matter in which the NGT has jurisdictional power shall be decided by any other civil court.

Section 30 states that a court can entertain an offence under this Act only if the Union Government files a complaint or if a person provides 60 days' prior notice.

3.18 Institutional and Regulatory Bodies

3.18.1 Central Pollution Control Board (CPCB):

It has been assigned various tasks related to pollution. Potential health effects of SWM are addressed by the CPCB, forming specialized Expert Groups with the assistance of its highly qualified workforce and outside experts. These teams also evaluate the harm done to the environment. When it came to disposing of waste, the CPCB set the standard for scientifically managing BMW. As a regulatory body, CPCB has developed several regulations to ensure adherence to environmental

standards, either as part of its mandate or in response to court orders. For example, the CPCB created guidelines in 2020–21 for Producer Responsibility Organizations (PROs) and implemented Environmental Compensation Charges (ECC) under the regulations governing e-waste (Ministry of Environment, Forest and Climate Change, n.d.).

A standard procedure was developed for carrying out inspections, writing reports, and completing required tasks. Expert Groups were established by the CPCB to address the degradation of the environment as a major concern. These groups were established in response to the growing need for expert counsel and technological improvements to offer specialized technical advice on a range of environmental challenges. The following fields are covered by experts in the Expert Groups: water quality management, treatment, storage, and disposal facilities, e-waste management, health impacts of air pollution, control of vehicular pollution, satellite-based air quality monitoring, and management of sewage, sewer systems, etc. These organizations are in charge of investigating, counselling, and providing technical support to CPCB regarding these important matters (Central Pollution Control Board, 2021).

The CPCB, to tackle air pollution in Delhi, has approved the grant-in-aid of Rs 100 crores in the year 2022-2023. Several initiatives were made by the CPCB with the support of the DPCB to combat Delhi pollution, like the installation of the Smog tower at Anand Bihar to meet the requirements directed by the NGT, a wind portal was created for harmonization of work between CPCB and DPCB, etc. Apart from it, numerous plans are carried out by the CPCB to tackle environmental pollution. (Central Pollution Control Board, 2022).

The CPCB is supervising the E-waste Rules, 2016, which includes random verification of dismantlers/recyclers, random inspection of EPR producers, implementation of an Action plan, and preparation of annual returns from PROS.

India generated about 12.35 million tonnes of waste, which is hazardous in nature, during 2021-2022, of which 22.90% is recyclable, 24.72% is landfillable, 5.92% is incinerable, and 46.46% is utilizable. CPCB has established a system of environmental audit, captive treatment, storage, and disposal mechanisms with regard to Hazardous Waste Management (Central Pollution Control Board, 2022). Total SW produced in the year 2021-2022 is 1,60,038.9 TPD, and its collection is 1,52,749 TPD (95.4%). Total Solid Waste Treated is 79956.3 TPD (49.96%), and Unaccounted solid waste is 43365.7 TPD (27.1%) (Central Pollution Control Board, 2022).

The CPCB's Annual Report 2021 estimates that India creates 1,50,847 tonnes of solid trash each day. It was estimated that 96.8% of Solid Waste was collected, but only 47% is treated. The identified solid waste landfilled sites are 1359, but only 379 sites are functioning in 21 states of the country. It is also observed that 27.08% of solid waste was found to be landfilled. 25.8 of % Solid Waste was unaccounted. The CPCB is empowered to implement the solid waste provisions of the SWM Rule 2016 under Section 5 of the EPA 1986. CPCB and DPCC conducted joint monitoring under the guidance of NGT. It was found that 3 of the waste-to-energy plants are found to be non-compliant, and these plants were served with show show-cause notice.

Contaminated sites refer to dumping grounds that are contaminated by hazardous and other types of toxic waste in a country. There are a total of 103 contaminated sites in India. Seven of the 103 contaminated sites are now being remedied, and full Project Reports have been completed for ten of them, although

remediation is still required. There are still 93 potentially polluted sites under investigation (Central Pollution Control Board, 2025).

3.18.2 State Pollution Control Boards (SPCBs):

India has 29 SPCBs and six PCCs as of April 8, 2025. On June 2, 1975, the Water (Prevention and Control of Pollution) Act of 1974 created the APCB. It runs nine regional offices around Assam, including two in Guwahati, in addition to its headquarters office in Bamunimaidam, Guwahati. The Head Office in Guwahati is home to the core laboratory. (Pollution Control Board, Assam, 2020).

Over time, APCB's responsibilities grew to include the administration of numerous other environmental laws and regulations, increasing its function to address a wide variety of environmental protection issues other than water pollution. APCB is responsible for a clean environment and encouraging the state's industrial sector to flourish sustainably. The prime functions of the board are:

- Organizing initiatives to stop, manage, and lessen air and water pollution.
- Offering guidance on pollution control methods to the State Government.
- Gathering and disseminating data regarding air and water pollution.
- Carrying out and assisting with environmental research.
- It deals with the problem of contaminants in streams and wells not being sufficiently diluted and creates techniques for using trade and sewage effluents in agriculture.
- The Board provides directives to regulate trash disposal into streams and wells, as well as establishes and enforces standards for effluent treatment before release into water bodies.

- It offers guidance on where to locate enterprises to minimize pollution, gives industries the required environmental permits, and teaches the public about environmental issues.
- Under the various Acts, the Board creates laboratories for pollution monitoring and ensures that environmental regulations are followed.

The APCB regulates waste treatment and disposal; therefore, it has to make sure that the sewage and industrial effluents do not contaminate the environment, and supports environmentally friendly waste utilization practices. These operations are closely tied to waste management. As part of its responsibility under SWM Rules 2016, the APCB has held a number of workshops to create awareness among municipal bodies about appropriate waste management techniques. Additionally, the Board has provided notices and directions to various bodies to ensure that the Rules are properly implemented (Pollution Control Board, Assam, n.d.).

3.19 State Laws Dealing with Solid Waste Management

3.19.1 The Guwahati Non-Biodegradable Garbage (Control And Prevention) Act 2006

It was enforced on 23rd August 2006. This Act defines numerous definitions, some of which are as follows: Biodegradable garbage" refers to waste which are of a decomposable nature.

A garbage receptacle refers to a common bin or a place where garbage is collected.

House-gully refers to a track or pathway that provides access to a drain or a toilet, which is used for cleaning and waste extraction.

Section 3 prohibits the disposal of both biodegradable and non-biodegradable rubbish in private or public drainage and sewage systems. The waste dumped in the river, lake, or wetland pollutes the environment and causes a public health hazard.

Section 4 states that the state government can put restrictions on using certain non-biodegradable garbage within the Guwahati Municipality area.

Section 5 states that the local authority is vested with the duty to provide receptacles and provide a proper place to dispose of the garbage. It is also their duty to provide different dustbins for non-biodegradable waste.

Section 8 states that the Assam Government entrusts the GMC or the GMDA with the right to enter and investigate any documents or records of any building falling under the municipal area.

Section 9 deals with the penalty provision. It states that whoever violates the provision of the Act shall pay a fine of ₹2000. For the second offence, the fine is ₹5000, and for the subsequent offence, the fine is 25000 and three months of imprisonment.

3.19.2 The Assam Municipal Corporation Act, 2022

There are numerous definitions defined in this act some of the definition which are defined in this Act are bio-medical waste, commissioner, corporation, councillor, dangerous disease, drain, dwelling house, footpath, hazardous process, hazardous waste, house drain, house gully, hut, industrial Township, infectious disease, municipality area, private drain, private street, sewage, street etc.

Section 27 deals with core function which states that the Municipal Corporation shall be responsible to provide services like providing adequate water, to provide a proper

drainage and sewage system and solid waste management system, providing the municipality resident with footpaths, pedestrian pathways, transportation terminal, bridges, etc., for communication system; providing healthcare services, planting trees on roadside, providing with marketplaces and slaughter houses, promoting educational sports and cultural activities, providing aesthetic environment, creating and managing infrastructure to discharge its function etc.

Section 28 of this Act deals with the other function of the Municipal Corporation which includes Town Planning, Urban Development, Environment Protection etc. In the Town Planning and Urban Development, it includes developing and planning residential area, beautification of the area with the help of parks, fountains, etc, collecting important community-related data, and ensuring developmental plans. Environmental Protection it includes reclaiming the wasteland, afforestation, public participation for Environmental Protection, taking measures to eradicate all forms of pollution, etc.

Section 63 of this Act deals with the transparency and accountability of the Municipal Corporation regarding finances.

Section 88 provides that the Municipal Corporation is entrusted with the power to levy a charge on the user for providing water supply, drainage, SWM, parking of vehicles, and other specific services.

Section 155 of this Act states that the Municipal Corporation may discharge its function on its own or with the help of private participation.

Section 191 states that the Municipal Corporation of Assam is vested with the power to collect solid waste through community dustbins, door-to-door collection, or any other method. It is also responsible for collecting waste from the slum areas and from

commercial restaurants, hotels, etc. It will also ensure that the timely disposal of the collected waste is done daily.

Section 193 provides that the Municipal Corporation is vested with the power to dispose of the solid waste within or outside the municipal area, subject to the restriction that it should not be contrary to the state law or any other law in use.

Section 194 states that it is the duty of the occupier or the owner of the premises to regularly clean their premises and to provide three separate bins for organic and biodegradable waste, etc. It is also their duty to keep the bin in good condition

Section 195 states that it is the duty of the cooperative housing society, etc, to provide for community bins or disposal bags and a separate dustbin for recyclable waste.

Section 196 states that no person or owner is allowed within the municipal area to litter, dump waste, including dead animals, or allow filthy matter in public places.

Section 197 provides for the punishment for littering or dumping the solid waste in any street or public place where this Act applies. The punishment for littering or dumping the solid waste will attract a compensation of Rs 5000 for each offence. Such fine shall be collected by the officer not below the rank of sanitary inspector.

Section 216 states that it is the responsibility of the MC to defend environmental development and urban management. This function includes providing clean water, affordable sanitation, sustainable solid waste management, collection of toxic waste, protection of wetlands, controlling air pollution and sound pollution, controlling cattle and other animal in the municipality area, improvement and resettlement of area, promoting urban agriculture and urban forestry, establishment of park and garden including open space, promoting community awareness on environmental education and such other matter which the corporation may think fit.

3.20 Evaluating the Challenges and Limitations of India's Waste Management Rules

The major problem of the waste management laws in India lies in their poor implementation and lack of enforcement. The absence of facilities for trash segregation, recycling, and processing is one example of an infrastructure constraint. Local authorities often confront financial limits. Effective segregation and responsible waste disposal at the source are challenging to achieve because of the low level of public participation that persists despite insufficient awareness and engagement initiatives. The lack of sufficient penalties for infractions prevents trash generators, local government agencies, and businesses from complying with regulations. Coordinated waste management initiatives are further hampered by overlapping jurisdictions with other environmental laws and regulatory agencies, which lead to confusion and inefficiency. The EPA provisions are also less relevant to current demands because it is not regularly updated to keep up with changing waste management concerns and technological improvements.

SWM Rules, 2016, tried to address the problem of management of SW in specific domains, but it proved to be insufficient as an ad-hoc arrangement in the form of this rule delegated substantial responsibilities to the local government. Also, these Rules fail to recognize the rights and duties of the waste pickers despite their significant contribution in handling the garbage of the city. The SWM Rules concentrate primarily on the operational aspects of waste management, which include collection, disposal, and segregation. However, it lacks a procedure to offer these waste pickers or individuals, or communities engaged with detailed education and training. Although several states have postponed the creation of their state-level advisory boards, Rule 23 of the SWM Rules of 2016 mandates that they be

established within six months of the Rules' introduction. More emphasis is placed on segregation and disposal rather than limiting trash generation at the source, which is regarded the hierarchy in waste management (Rule 4).

Numerous Rules of SWM 2016 overlap with one another. Resident Welfare Associations & Institutions, Local Authorities are assigned a similar function of collection and segregation without any coordination guidelines. Apart from that, the Rules of 2016 also overlap with other Rules of the EPA Act. All these Rules of the EPA deal with various categories of solid waste and often their responsibility come into conflict with one another. For instance, both SWM and the Plastic Waste Management assign duties of collection, segregation, which creates confusion among the local bodies and plastic producers. Similarly, biomedical waste and e-waste are both solid waste and often mixed up with the municipal solid waste, even though they have separate rules. Although the SWM Rules 2016 mention about integration of waste pickers in Rule 15 however it lacks a proper framework to integrate them into the formal sector of the economy. Ambiguity can be observed in the implementation of timeline in the Rules, as Rule 22 mentions a 1-year timeline for implementation; however, no penalty follows in case of delays.

Apart from it, the EPA, 1986 has insufficient monitoring and reporting mechanisms. The penalties provided under the EPA1986 are not stringent in their operation. Moreover, the EPA 1986 has a centralised decision-making process, which requires CG permission for environmental clearance and approval, which frequently causes delays in decision-making.

Some of the developmental projects of the states require prompt approval; however, due to delays in approval, the projects remain pending for a long period.

Although the main focus of these regulations is on municipal solid waste, they do not include other important waste streams, such as building and demolition waste, battery waste, or plastic garbage, which are all subject to different restrictions. This regulation division hinders the creation of a cohesive waste management plan and often leads to fragmented management approaches.

The Solid Waste Management Rules of 2024 draft regulations were submitted by the MoEFCC in order to address these inequities. Waste is divided into four categories under the proposed SWM Rules 2024: biodegradable, non-biodegradable, sanitary, and special care waste, such as hazardous waste, as compared to the earlier Rules of 2016, which had only three-way segregation, for example, hazardous, wet, and dry. The earlier Rules of 2016 lacked clarity relating to the producer or generator of waste, such as hotels, religious places; however, these new rules include the community level of entities. The new Rules of 2024 have provisions relating to EPR responsibility, which now include the brand owner and manufacturer. Earlier, the systematic accountability was missing in the 2016 rules; now, the 2024 Draft rules include online registration, quarterly and annual reporting, and compliance with the guidelines of CPCB.

The new 2024 Rules include a Bulk Waste Generator Responsibility Certificate for proper handling and processing, which is a new addition to the SWM Rules 2016. The new Rules contain provisions relating to the Online Portal and Centralized Tracking, which include tracking for sanitary waste, requiring the respondents to register and report on a centralized portal managed by the CPC and the ULBs.

However, numerous defects can be observed in these Rules. Such as there is still no clear penalty structure provided in these rules. Some of the Solid Waste, such

as plastic and hazardous waste, is dealt with under specific rules of the EPA, which are often mixed with municipal waste. Therefore, the overlapping of responsibility for dealing with these kinds of waste persists. Similar to the earlier Rules, it does not provide any deadline for the targeted infrastructure development or a penalty in case of delay. It excludes the legacy waste provisions. While there is a mention regarding waste pickers in the SWM Rules 2024, there is no supportive, safe, or fully inclusive structure, such as compulsory training, which is laid out in these rules. For these essential workers to gain official recognition, protective measures, sustained engagement, and social security benefits, greater reforms are necessary.

Chapter - 4

Challenges of Solid Waste Management in Assam

4.1 Introduction:

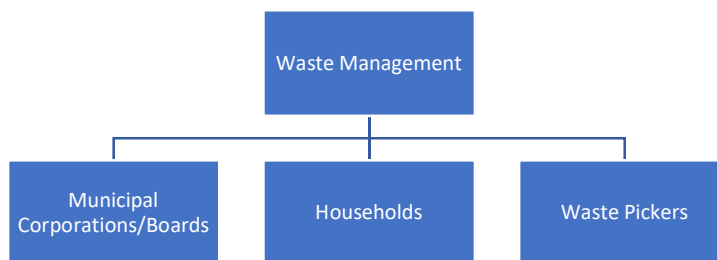
The biggest challenge that the entire Assam is facing is that of managing waste effectively. With rapid urbanisation and an increase in population, the consumption level has increased to a significant extent, and with the growth in the urban population, the quantity of garbage produced has also increased to a significant extent. Challenges such as inefficient garbage collection, insufficient transportation, and improper disposal can be seen in the state economy of Assam. Waste management often includes a number of tasks, including disposing of waste, recycling methods, shipment, collecting, and classification. Garbage management frequently entails a variety of activities, such as garbage disposal, recycling techniques, shipping, gathering, and classification. The obligation of handling waste in India is vested with the MoEFCC. The functions of this Ministry are to prevent pollution and to release rules for a healthy environment. Further, this responsibility is carried on by the CPCB and the SPCB to ensure efficient enforcement of the rules that were set up by the MoEFCC. According to the Government of Assam website, all the local urban bodies are covered under the purview of the MSW Rules 2000. The Governing Body of the MSW Rules has recognized 156 local bodies that come within the domain of these rules. Among these, 75 are categorized as Urban Local Governments. The Application for authorization may be collected from the offices of the PCB of the State or its website. According to data gathered from the State Government of

Assam's official website, none of the local government organizations fulfilled the requirements outlined in Schedule I within the timeframe specified.

According to the official website of the Assam Government, a public hearing for the project was held on December 17, 2014. However, the website fails to provide updated status about the same (Assam Pollution Control Board, n.d.). Currently, the SWM 2016 has replaced the earlier MSW Rules of 2000, which have not been updated on the website. Today, Assam is working according to the SWM Rules 2016.

The current SWM practices in Assam are studied with empirical data collected from various municipalities of Assam. There are 35 districts in Assam. Out of 35 districts, 11 districts were selected for the study. The empirical data are divided into three stages. In the first stage, 11 Municipal boards/corporations are interviewed with the help of scheduled questions. From the Municipal data, the various practices of waste management practices in Assam can be analysed. In the second stage, 50 samples from each municipal area are collected. In the third category, the main emphasis has been laid on the segregation technique, which is observed in the dumping sites, that is generally done by the waste pickers. There is a total of 35 samples of waste pickers collected in this process.

The Data Surveyed is divided into three parts that are :



4.2 An Analysis of Municipality Data:

Municipal Corporation/ Board's data is crucial to study and analyse the present working mechanism in a particular municipality. The population of 11 municipalities as of the 2011 census is included in this table. The floating population of the municipal area is also mentioned for 11 districts of Assam. Further in this table, number of wards and the total geographical area of the municipality are provided. Table 4.1 shows the municipality profile in Assam.

Table 4.1

Municipality Profile in Assam.

Sl.No	Municipality	Population (2011 census)			Floating Population (per day)	No of wards	Area in sq/km
		Male	Female	Total			
1	Guwahati	495362	461990	957352	3, 00,000	60	162.79
2	Dibrugarh	72,414	67,151	139565	12,942	22	15.5
3	Sivasagar	27,300	23,000	50,300	1000	14	10.95
4	Tinsukia	52179	47,269	99448	10,000	15	10.58
5	Tezpur	28566	29993	58559	2000	19	7.10
6	Biswanath	9507	9155	18662	N/A	12	6.02
7	Morigaon	14780	14402	29182	2,500	11	4.1
8	Goalpara	16,970	16,460	33430	3350	19	12.76
9	Nalbari	14425	13414	27839	30,000	17	13.26
10	Silchar	86812	85897	172709	15,000	28	15.75
11	Haflong	22787	20866	43653	12,00	13	12.79

Source: Municipality Data

In 2011 population of Assam was 31205576. Under the municipality profile in Assam, Guwahati city recorded the highest population, that is, 957353. It is 3.068 %. Biswanath Municipality Board recorded the lowest population (18,662). It is 0.060 %.

The floating population was the highest in the Guwahati city (3,00,000), whereas the lowest floating population was recorded in the Sivsagar municipality board (1000). The highest municipal wards are recorded in Guwahati city (60), and the lowest municipal wards are recorded in Morigaon (11) town. The Guwahati city has the largest area in square km (162.79 sq.km.), whereas Morigaon has the lowest municipality area (4.1 sq.km.).

Status of Employees in the Municipality Boards/Corporations: The number of staff in the Municipality Boards/Corporations in Assam is shown in Table 4.2 The number of employees in a municipality determines both the workload and the current functions of the municipal corporation or boards. A shortage of staff hinders the municipality's efficient functioning.

Table 4.2

Total No. of Staff in the Municipality Boards/Corporations.

Sl.no	Name of the Municipality	Permanent staff	Temporary Staffs	Contractual Staff	Adhoc	Daily Basis	Vacant
1	Guwahati	1345	-	202	-		1299
2	Dibrugarh	81	-	119		122	Nil
3	Sivasagar	84	60	78	nil	Nil	Nil
4	Tinsukia	88	0	0	163	135	Nil
5	Tezpur	43	Nil	8	nil	160	Nil
6	Biswanath	35	3	-	-	54	Nil
7	Morigaon	18	7	12	-	34	Nil
8	Goalpara	18	-	39	-	115	46
9	Nalbari	45	34	-	-	21	Nil
10	Silchar	144	156	-	-	-	-
11	Haflong	80	17	-	-	-	-

Source: Municipality Data

The above data analysis shows that there is satisfactory number of staffs in Guwahati, Dibrugarh, Tinsukia and Haflong in municipal corporation/boards. The number of contractual staffs is high in Guwahati, Dibrugarh, Sivasagar and Goalpara.

Solid Waste Management Practices in the Municipal Corporations/Boards: Table 4.3 shows waste produced daily, waste collected daily, number of dustbins, and number of dumping sites in each municipality area

Table 4.3

Solid Waste Management Practices in the Municipal Corporation/Boards

Sl.No	Name of the Municipalities	Waste Generated Per Day (MT)	Collection per day (MT)	No of Dustbins	No of Dumping Sites
1	Guwahati	550 TPD	550 TPD	194	1
2	Dibrugarh	57	50	Nil	1
3	Sivasagar	23	19	Bin free	1
4	Tinsukia	70	70	Bin free	1
5	Tejpur	35	34	Bin Free	No permanent dumping site
6	Bishwanath	5 TPD	5 TPD	Nil	1
7	Morigaon	11 TPD	8.5 TPD	10	1
8	Goalpara	16.0 TPD	12.8 TPD	19	1
9	Nalbari	9TPD	6.8 TPD	10	1
10	Silchar	85 TPD	80 TPD	Bin free	1
11	Haflong	7 TPD	6.9 TPD	50	1

Source: Municipality Data

It is observed that the Guwahati City generates the highest amount of waste, and the lowest amount was generated in the Biswanath Municipal area. It was found in a field survey that people in the Biswanath municipal area practice burning waste. In Dibrugarh and Biswanath, there is no provision for dustbins. It is also found in the field survey that the bin-free municipal area refers to an area where door-to-door waste is collected; therefore, there is no need for bins.

Vehicles Used for Waste Disposal in Municipal Boards/Corporations: Different types of vehicles are used for waste disposal in municipal boards/corporations. These are tractors, mini trucks, trucks, Dippers, push carts, compactors, dumper placer, JCB, etc. Table 4.4 shows vehicles used for waste disposal in 11 sample municipal boards/corporations.

Table 4.4

Vehicles Used for Waste Disposal in Municipal Board/Corporation

Name of the Municipality	Tractors	Mini Trucks	Trucks	Trippers	Push Carts	Compactors	Dumpers	Others	Total
Guwahati	0	6	0	15	200	22	26	132	401
Dibrugarh	6	2	0	37	0	3	2	13	63
Sivasagar	2	0	0	7	0	1	4	1	15
Tinsukia	3	16	3	0	10	0	3	7	42
Tejpur	2	8	2	0	21	1	2	2	38
Bishwanath	4	1	3	5	5	0	0	5	23
Morigaon	4	3	0	7	0	1	0	9	24
Goalpara	3	2	0	7	10	1	0	2	25
Nalbari	2	0	0	6	0	0	2	7	17
Silchar	2	5	5	2	0	2	0	0	16
Haflong	1	2	1	4	0	0	0	1	9

Source: Municipality Data

4.3 An Analysis of Household Data: Household data were collected from 11 municipal areas of Assam using a questionnaire. Fifty samples are gathered from every municipal area. 550 respondents constitute the survey's sample size. There are five sections to the questionnaire such as (A) General Information, (B) Solid Waste Management, (C) Sustainable Development, (D) Environmental Impact, and (E) Environmental Laws. Table 4.5 displays information on the socio-demographic factors of respondents.

Table 4.5

Information on Socio-Demographic Variables of Respondents

Variables	Category of variables	Frequency	Percent
Age groups	Less than 20 years	125	22.7
	21 - 30 years	169	30.7
	31 - 40 years	109	19.8
	41 - 50 years	77	14.0
	Above 50 years	70	12.7
	Total	550	100.0
	Mean Age of Respondents		32.22
Gender	Male	235	42.7
	Female	315	57.3
	Total	550	100.0
Education	Below HSLC	5	.9
	HSLC to Higher Secondary	147	26.7
	Graduate	166	30.2
	Post Graduate	131	23.8
	PG and Others	101	18.4
	Total	550	100.0

Occupation	Agriculture	5	0.9
	Service	299	54.4
	Business	10	1.8
	Research Scholar	14	2.5
	Private job	14	2.5
	Self employed	13	2.4
	Students	195	35.5
	Total	550	100.0

Source: Field Study

From the table 4.5, it can be analysed that 22.7% of the respondents are less than 20 years of age, 30.7% of them belong to the age group of 21-30 years, 19.8% of the total population belong to the age group of 31-40, 14% of them belong to the age group of 41- 50 and 12.7% of the respondents are above 50 years.

From the above table, it can be analysed that out of the total respondents, 42.7% of the respondents are male and 57.3% of the respondents are female.

It can be analysed that 0.9% of the respondents have not passed their HSLC exam. 26.7% of the respondents have completed their HSLC and Higher Secondary, 30.2% have completed their graduation, 23.8% have completed their post-graduation, and 18.4% have completed their post-graduation and above.

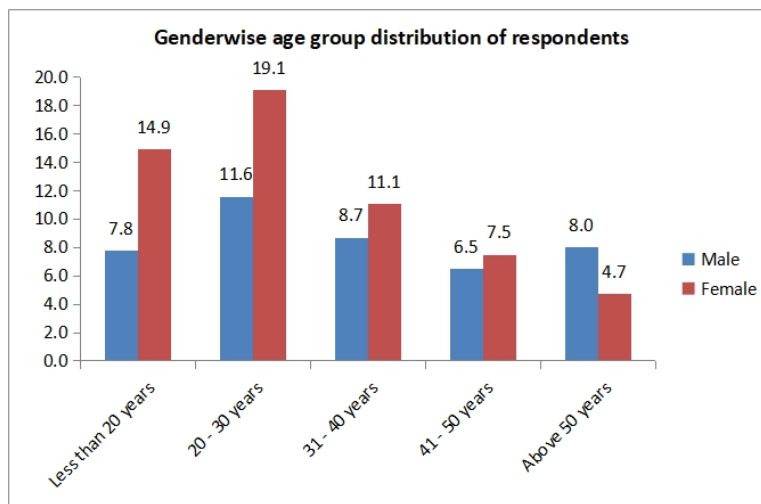
From the above table, it can be analysed that 0.9% of the respondents depend on agricultural activities, 54.4% of the respondents are doing service, 1.8% of them

do business, 2.5% are research scholars, 2.5% of them do private jobs, 2.4% are self-employed, and 35.5% are students.

Distribution of Respondents by Gender and Age Group: In environmental studies, like a survey of a municipal area, it is essential to include both male and female respondents. Another aspect of female respondents is how to dispose of domestic waste, because in an urban setting, it is a major issue for families. The behavior of different age groups also shows how they respond to solid waste management issues. Figure 4.1 displays the distribution of the respondents by gender and age group.

Figure 4.1

Distribution of Respondents by Gender and Age group



Source: Field Survey

Family Size: In a demographics study, the size of a family is an important component. It is the population growth pattern that determines the size of the family. The number of family members in the family is shown in Table 4.6 below:

Table 4.6

Number of Family Members in the Family

Variables	Category of variables	Frequency	Percent	Average number in the household
Male members in the household	No male member	17	3.1	Female member = 2.03
	1 – 2	384	69.8	
	3 – 4	142	25.8	
	5 – 6	7	1.3	
	Total	550	100.0	
Female members in households	No female member	2	.4	Male member = 2.28
	1 – 2	351	63.8	
	3 – 4	178	32.4	
	5 – 6	19	3.5	
	Total	550	100.0	
Total household members	1 – 3	156	28.4	Total members = 4.31
	4 – 6	355	64.5	
	7 – 9	34	6.2	
	10 and above	5	.9	
	Total	550	100.0	

Source: Field Work

From table 4.6, it can be analysed that 3.1% of the households have no male members in their houses, 69.8% of the households have 1-2 male members, 25.8% of the households have 3 to 4 male members, and 1.3% of the households have 5 to 6 male members in their houses.

It can be interpreted that 0.4 of the total households have no female members, 63.8 % of the households have 1 to 2 female members, 32.4% of the households have 3 to 4 female members, and 3.5% have 5 to 6 female members.

Duration of Stay in Municipal Area: Duration of stay in a municipal area also determines people's habit of managing household waste. People staying for a short period may not be aware of the urban lifestyle, that is, the timely disposal of waste, whereas people staying for a longer period may have been well acquainted with the best practices of waste management. Table 4.7 shows the duration of stay in the Municipal area:

Table 4.7

Duration of Stay in the Municipality Area

Duration of stay	Frequency	Percent
Since childhood	225	40.9
1 - 5 years	60	10.9
6 - 10 years	48	8.7
11 - 15 years	33	6.0
16 - 20 years	51	9.3
Above 20 years	133	24.2
Total	550	100.0

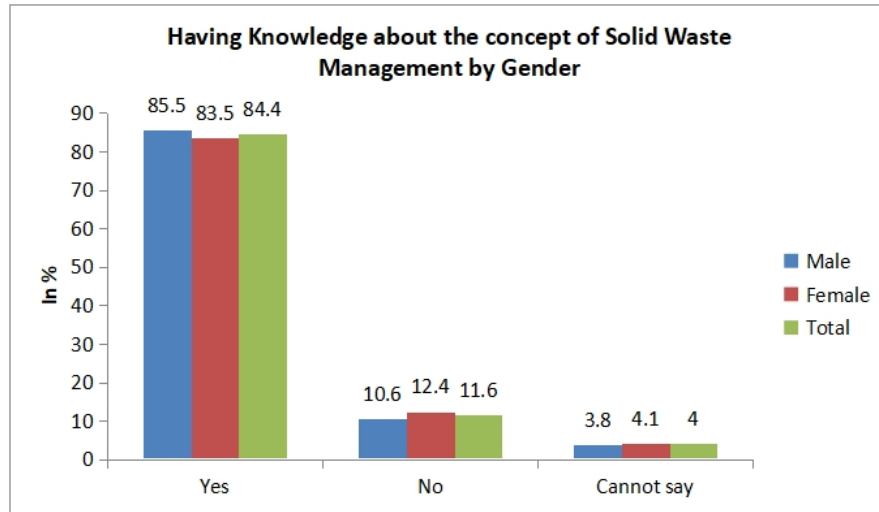
Source: Field Survey

It can be analysed from the table: 4.7, that 40.9% of the respondents have been staying in a municipality area since childhood, 10.9% have been staying for 1 to 5 years, 8.7% have been staying for 6 to 10 years, 6% have been staying for 11 to 15 years, 9.3 % have been staying for 16 to 20 years and 24.2% have been staying for above 20 years.

Knowledge of Solid Waste Management (SWM): Knowledge of SWM is an important indicator to know the practices of SWM followed by the municipality boards/corporations. Figure 4.2 shows the distribution of knowledge of the concept of SWM by gender.

Figure 4.2

Distribution of having Knowledge about the concept of Solid Waste Management (SWM) by Gender



From the above figure 4.2, it can be interpreted that out of the total male respondents, 85.5% of the respondents have knowledge about solid waste management system, 10.6% of them do not have any knowledge about solid waste management and 3.8% are not sure about their response. Out of the total female respondents, 83.5% know solid waste management, 12.4% of them do not have any knowledge about solid waste management, and 4.1% are unsure about their response.

Sources of Knowledge: Respondents learn about solid waste management from a variety of sources such as newspapers, television, public meeting, educational

institutions, ngo's, and others. Table 4.8 depicts the distribution of knowledge sources on the solid waste management concept by gender

Table 4.8

Distribution of Sources of Knowledge about the Concept of Solid Waste Management by Gender

	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Newspaper	97	48.3	109	41.4	206	44.4
TV	97	48.3	115	43.7	212	45.7
Public Meeting	47	23.4	33	12.5	80	17.2
Educational Institution	89	44.3	128	48.7	217	46.8
NGOs	20	10.0	19	7.2	39	8.4
Others	14	7.0	16	6.1	30	6.5

Source: Field Survey

From the above table 4.8, it can be interpreted that 48.3% of the total male population received the knowledge of SWM from newspaper, the same percentage of the respondents' i.e. 48.3% received knowledge from TV, 23.4% of them understood the concept from public meetings, 44.3% received the information of solid waste management from educational institutions, 10% received the knowledge from NGOs and 7% understood the concept from other sources.

From the above table it can be analysed that out of the total female respondents 41.4% of them got the knowledge of solid waste management from newspaper, 43.7% of them got the knowledge about solid waste management from

television, 12.5% received the idea from public meetings, 48.7% were taught about solid waste management in educational institutions, 7.2% got the idea about it from NGOs and 6.1% got the knowledge from other sources.

Table 4.9

Distribution of having Knowledge about the concept of Solid Waste Management by Educational Qualification of Respondents

B1	Educational Qualification of Respondents									
	Below HSLC		HSLC to Higher Secondary		Graduate		Post Graduate		PG and Others	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	4	80.0	110	74.8	137	82.5	119	90.8	94	93.1
No	1	20.0	23	15.6	23	13.9	11	8.4	6	5.9
Cannot say	0	.0	14	9.5	6	3.6	1	.8	1	1.0
Total	5	100.0	147	100.0	166	100.0	131	100.0	101	100.0

Source: Field Work

The above table 4.9, represents the percentage of the population according to their educational qualification and their knowledge about the concept of SWM. Out of the total respondents 80% of them who did not pass their HSLC have knowledge about SWM, and 20% of them do not have an idea about solid waste management.

Among the respondents who have completed their HSLC and higher secondary, 74.8% have knowledge about solid waste management, 15.6% do not possess any knowledge about solid waste management, and 9.5% didn't say anything. Out of the total respondents, 82.5% of them who have completed their graduation know the concept of solid waste management, while 13.9% of them do not possess any knowledge. Among the respondents who have completed their postgraduate

studies, 90.8 % know solid waste management, 8.4% do not possess any knowledge about solid waste management, and 0.8 did not say anything. Out of the total respondents, 93.1 % of them who possess PG and other qualifications know solid waste management, 5.9 % of them have no idea of solid waste management, and 1 % did not say anything.

Table 4.10

Distribution of Sources of Knowledge about the concept of Solid Waste Management by Educational Qualification of Respondents

B2 Sources of Knowledge	Educational Qualification of Respondents									
	Below HSLC		HSLC to Higher Secondary		Graduate		Post Graduate		PG and Others	
	Count	%	Count	%	t	%	t	%	t	%
Newspaper	1	25.0	40	36.4	66	48.2	53	44.5	46	48.9
TV	1	25.0	29	26.4	79	57.7	50	42.0	53	56.4
Public Meeting	0	.0	15	13.6	21	15.3	18	15.1	26	27.7
Educational Institution	1	25.0	41	37.3	49	35.8	71	59.7	55	58.5
NGOs	0	.0	3	2.7	9	6.6	11	9.2	16	17.0
Others	1	25.0	10	9.1	7	5.1	6	5.0	6	6.4

Source: Field Survey

It can be analysed from Table 4.10 that respondents who have agreed to the question that they know solid waste management, are divided according to their educational qualification. Many of the respondents provided multiple-choice answers. 25% of the respondents who have an education below HSLC level gained their

knowledge from newspapers. 25% of them have gained their knowledge from television, 25% have gained knowledge from educational institutions, and 25% have gained their knowledge from other sources. Out of the respondents who have completed their HSLC and Higher Secondary exams, 36.4% of them have acquired their knowledge from newspaper, 26.4% of them have received their knowledge from television, 13.6% got the knowledge from public meeting, 37.3% have received their knowledge from educational institutions, 2.7% from NGOs and 9.1% have received it from other sources. The respondents who have graduated and have knowledge about solid waste management, among them, 48.2% have received the knowledge from newspapers, 57.7% have gained knowledge from television, 15.3% have it from public meetings, 35.8% from educational institutions, 6.6% from NGOs, and 5.1% from others. The respondents who have post graduated, among them 44.5% have gathered the knowledge from newspaper, 42% have received knowledge about solid waste management from television, 15.1% have got it from public meeting, 59.7% have received knowledge from educational institutions, 9.2% have received it from NGOs and 5% have received the knowledge from other sources. Respondents who have Post Graduate and other level of education have who have agreed about knowing solid waste management, 48.9% have received it from newspapers, 56.4% have got it from television, 27.7% have got the knowledge from public meeting, 58.5% have got it from educational institution, 17% have received the knowledge from NGOs and 6.4% have received it from other sources.

Training by Municipal Corporation/Boards: There is provision for education/training by the municipal corporations/ Boards for proper waste disposal mechanism. Table 4.11 shows Education / Training on proper waste disposal mechanisms by Municipal Corporation/Boards

Table 4.11

Education / Trained on Proper Waste Disposal Mechanisms by Municipal Corporation/Boards

B3	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	57	24.3	60	19.0	117	21.3
No	167	71.1	238	75.6	405	73.6
Cannot say	11	4.7	17	5.4	28	5.1
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

Out of the total male respondents 24.3% have expressed that they received education on proper waste disposal mechanism by Municipal Corporation. 71.1% have said that they did not have any education on proper waste disposal mechanism and 4.7% have not said anything. Out of the total female respondents, 19% have said that they received proper education/training on proper waste disposal mechanisms by the Municipal Corporation, 75.6% have denied receiving any education/ training on proper waste disposal mechanisms by the Municipal Corporation/Boards, and 5.4% of the respondents did not say anything.

Solid Waste Generated by the Household Sector: The Household sector produces different types of solid waste. These include plastic bags/bottles, vegetable waste, glass, waste paper cartons, electronic waste, fibre bags, and other materials. Table 4.12 highlights types of solid waste that are generated from households:

Table 4.12

Types of Solid Waste that come out from the Households

Types of Solid Waste b4	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Plastic bags/bottles	191	81.3	255	81.0	446	81.1
Vegetable waste	167	71.1	207	65.7	374	68.0
Glass	55	23.4	61	19.4	116	21.1
Waste paper cartoons	110	46.8	136	43.2	246	44.7
Electronic waste	60	25.5	58	18.4	118	21.5
Fiber bags	30	12.8	58	18.4	88	16.0
Others	4	1.7	6	1.9	10	1.8

Source: Field Study

Table 4.12 examines the different types of garbage that come from the households as responded by both genders, male and female. Many of the respondents provided multiple-choice answers. Out of the total male respondents 81.3% said that plastic bags/ bottles are solid wastes that come out of their households, 71.1% said that vegetable waste are the solid wastes from their households, 23.4% expressed that glass come out of their households, 46.8% responded that waste paper cartoons are the solid waste, 25.5% said that electronic waste is the waste from their households, 12.8% said that filter bags are the solid waste and 1.7% said that other things comes out of their households as solid waste.

Out of the total female respondents 81% of them said that plastic bags/ bottles are solid wastes that come out of their households, 65.7% of them expressed that vegetable waste are the solid wastes from their households, 19.4% of them said that glass waste is the solid waste from their household, 43.2% have expressed that waste paper cartoons are the solid wastes from their households, 18.4% had stated that the solid trash produced in their homes is electronic garbage, and the same proportion of responders

i.e. 18.4% have also expressed that fiber bags are the solid waste in their households. 1.9% of the respondents have expressed that other types of solid waste are present in their households.

Types of Containers: Numerous kinds of containers are used to collect solid garbage. These include plastic bags, waste baskets, old buckets, cartons, tins/cans, and other items. It has been noticed that households employ multiple types at once. Table 4.13 displays the many types of garbage collection containers.

Table 4.13

Types of Containers Used to Collect Waste

Type of container used	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Plastic bag	124	52.8	131	41.6	255	46.4
Waste basket	115	48.9	133	42.2	248	45.1
Old bucket	63	26.8	75	23.8	138	25.1
Cartoon	41	17.4	40	12.7	81	14.7
Tin / Can	19	8.1	22	7.0	41	7.5
Others	9	3.8	9	2.9	18	3.3

Source: Field Study

Table 4.13 represents the analysis of the types of containers used to collect waste in their households. The respondents are divided based on their genders. Many of the respondents provided multiple-choice answers. Out of the total male respondents, 52.8% use plastic bags to collect waste in their households, 48.9% use waste baskets to collect waste in their households, 26.8% use old buckets, 17.4% use cartons, 8.1% use tins/ cans, and 3.8% use other materials to collect waste in their households. Out of the total female respondents, 41.6% use plastic bags to collect their household wastes, 42.2% use a waste basket, 23.8% use an old bucket, 12.7% of use cartons as containers to collect waste, 7% use tin/can, and 2.9% use other containers to collect waste.

Sustainable Development (SD)

The goals of SD include the preservation of natural capital, the development of new technologies and procedures, the involvement of indigenous and local communities, international cooperation and coordination, affordable clean energy, clean water and sanitation, and more. It leads to a clean environment and takes care of the planet in the future. Proper disposal methods include incinerating medical waste, composting food waste, and recycling materials, which will prevent pollution and its associated consequences. Sustainable management of waste will foster a sense of duty within individuals and communities that producing waste is a natural part of human life, and responsible waste management demonstrates our dedication to minimizing the negative effects of our actions. By adopting new and upgraded technologies for waste management, we can create alternatives to landfills as conscientious residents.

An attempt has been made to study how far waste management is sustainable in the sample districts of Assam. For this purpose, five questions were asked to the respondents in the surveyed districts of Assam.

Table 4.14

Availability of Public Dustbins near the locality of the Respondents

C6	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	120	51.1	164	52.1	284	51.6
No	102	43.4	120	38.1	222	40.4
Cannot say	13	5.5	31	9.8	44	8.0
Total	235	100.0	315	100.0	550	100.0

Source: Field Work

Table 4.14 evaluates the availability of public dustbins near the locality of the respondents. Out of the total respondents, 51.6% have said that public dustbins are available near their locality, and 40.4% have denied the availability of the public dustbins near their locality. 8% of the respondents did not give a response.

Table 4.15

Solid Waste Container Emptied from the Locality of the Respondents

C7	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Daily	68	28.9	117	37.1	185	33.6
Once in two days	49	20.9	58	18.4	107	19.5
Once in three days	30	12.8	29	9.2	59	10.7
Weekly	44	18.7	46	14.6	90	16.4
Monthly	16	6.8	40	12.7	56	10.2
No response	28	11.9	25	7.9	53	9.6
Total	235	100.0	315	100.0	550	100.0

Source: Field Work

Table 4.15 presents the percentage of the respondents depending on their response to the question of how often is the solid waste container is emptied from their locality. Out of the total respondents 33.6% have said that the solid waste containers are emptied daily in their locality, 19.5% have said that it is done once in two days, 10.7% have said that it is done once in three days, 16.4% have said that it is done weekly and 10.2% have responded that it is done monthly. 9.6% of the respondents did not give any response.

Table 4.16

Nature of Deposition of Collected Solid Waste by the Respondents

C8	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Household bin	85	36.2	141	44.8	226	41.1
Public bin	55	23.4	77	24.4	132	24.0
Disposed of on the roadside	14	6.0	12	3.8	26	4.7
Open space	11	4.7	19	6.0	30	5.5
In own compound	31	13.2	35	11.1	66	12.0
Others	11	4.7	13	4.1	24	4.4
Household bin + public bin	24	10.2	15	4.8	39	7.1
Public bin + Road side	3	1.3	1	.3	4	.7
Public bin + Open space	1	.4	2	.6	3	.5
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

41.1% of respondents reported that they usually put away the solid waste in Household bin, 24.0% used Public bin, 4.7% disposed in roadside, 5.5% used open space, 12.0% throw it in own compound, 4.4% of respondents used other than above mention place, remaining 8.3% of respondents used combine modes of put away the solid waste.

Table 4.17

**The State of the Public Bin near the Locality of the Respondent in the
Municipal Area**

C9	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Rusting/Rotting	29	12.3	23	7.3	52	9.5
Smelly and consumed by animals	96	40.9	107	34.0	203	36.9
Clean and in a good state	64	27.2	88	27.9	152	27.6
Unhygienic and causing health hazards	64	27.2	97	30.8	161	29.3
Others	15	6.4	27	8.6	42	7.6

Source : Field Survey

36.9% of respondents stated that the public bins near them are smelly and consumed by animals, 29.3% have reported being unhygienic and causing health hazards, and 27.6% expressed that the dust bins are clean and in good condition. 9.5% told that they were rusting/rotting, 7.6% told as in other situations.

Table 4.18

Is the Solid Waste Disposal Mechanism a Problem in the Respondent Area?

C10	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	187	79.6	223	70.8	410	74.5
No	48	20.4	92	29.2	140	25.5
Total	235	100.0	315	100.0	550	100.0

Source: Field Work

In the above table 4.18, 74.5% of respondents think that the solid waste disposal mechanism is a problem in their area, where 79.6% of male respondents and 70.8% of female respondents reported.

Environment Impact

The Traditional approach of waste management has been considered as a sequence of steps involving collection, transportation, segregation, distribution, and waste disposal. However, this conventional approach tends to prioritize the mechanical aspects of waste handling, often neglecting the detrimental impact on the environment. However, in sustainable green technology, while dealing with waste management, keep in mind the deleterious effects of environmental degradation. It aims to undertake the sequential process of collection, transportation, segregation, distribution, and waste disposal with a profound consideration for their environmental consequence. This paradigm shift integrates environmental concerns into each phase while also focusing on the eradication of pollutants. Anthropogenic refers to those materials that are generated by human beings. Therefore, these products, which are made, manufactured, and created by human beings rather than naturally occurring. These items are dangerous to the environment. Examples of Anthropogenic products are plastic goods, electronic devices, chemicals, clothing, vehicles, etc. These products contribute to problems like management and their disposal. In order to mitigate their negative impact, one should opt for sustainable green technologies. These technologies consist of four important principles of production that involve reusing by-products instead of considering them as waste. Shifting production reduces the need for extracting harmful substances. Embracing production innovation through the careful selection of sustainable green technologies, which focuses the importance

of renewable sources of power and acquisition of biodegradable plastics, incorporates a dual strategy of employing energy recovery systems in production while simultaneously integrating sustainable green technologies, thereby fostering a harmonized approach towards environmentally responsible manufacturing practices.

In the questionnaire, respondents were asked seven questions about the environmental impact of garbage management.

Table 4.19

Do you Consider that Improper Solid Waste Disposal can Lead to Environmental Degradation?

D11	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	216	91.9	285	90.5	501	91.1
No	19	8.1	30	9.5	49	8.9
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

Environmental degradation can result from improper solid waste disposal, according to 91.1% of respondents. It can cause the situation of waterlogging, air pollution, and health hazards.

Table 4.20

Whom do you Consider Responsible for this State of Affairs?

D12	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Citizens	168	71.5	234	74.3	402	73.1
Municipality	84	35.7	95	30.2	179	32.5
Government policy	59	25.1	73	23.2	132	24.0
Enforcement mechanisms	48	20.4	57	18.1	105	19.1

Source: Field Survey

The respondents (73.1%) admitted that Citizens are responsible for the situation of environmental degradation. 32.5% stated that the Municipality boards are responsible, 24.0% expressed that government policy is responsible, and 19.1% Enforcement mechanisms are responsible.

Table 4.21

Do you Ever Notice Waste in the Road/Vacant Land/ Public Areas?

D13	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	220	93.6	296	94.0	516	93.8
No	15	6.4	19	6.0	34	6.2
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

The above table 4.21 and figure analyze the responses of the respondents on noticing waste in the road/ vacant land or public areas. Out of the total male respondents, 93.6% have said that they have noticed waste in roads / vacant lands and public areas. Out of the total female respondents, 93.8% have said that they have noticed waste in roads / vacant lands, and public areas. Overall, 93.8% respondents have noticed.

Table 4.22

**Have you Ever Noticed Solid Waste in Water Sources Such as
Rivers/Lakes/Wetland Areas or Other Water Bodies?**

D14-	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	213	90.6	274	87.0	487	88.5
No	22	9.4	41	13.0	63	11.5
Total	235	100.0	315	100.0	550	100.0

Source: Field Study

Table 4.22 examines that out of the total male respondents, 90.6% of them have noticed solid waste in water sources such as rivers/lakes/ wetland areas or other water bodies. And out of the total female respondents 87% of them have noticed solid waste in water sources such as rivers/lakes/wetland areas, or other water bodies.

Table 4.23

**Have you Ever Noticed the Burning of Solid Waste in Public Areas
Or Private Establishments?**

D15 -	Total					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	185	78.7	254	80.6	439	79.8
No	50	21.3	61	19.4	111	20.2
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

Out of the total male respondents, 78.7% have said that they have noticed burning of solid waste in public areas or private establishments. Out of the total female respondents, 80.6% of them have said that they have noticed burning of solid waste in public areas or private establishments.

Table 4.24

Do you Feel that Solid Waste Management is Responsible for Health-Related Issues?

D16	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	214	91.1	292	92.7	506	92.0
No	21	8.9	23	7.3	44	8.0
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

91.1% of all male respondents and 92.75% of all female respondents, respectively, stated that they believe solid waste management is to reason for health-related problems.

Table 4.25

Respondents were Asked About the Presence of the Following in and Around Public Waste Bins or Dumping Sites.

D17	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Odour	115	48.9	160	50.8	275	50.0
Contaminated water	72	30.6	88	27.9	160	29.1
Mosquitoes and insects	146	62.1	183	58.1	329	59.8
Domestic animals	106	45.1	143	45.4	249	45.3
Rats	73	31.1	79	25.1	152	27.6
Birds	66	28.1	81	25.7	147	26.7
Scavengers and rag pickers	64	27.2	95	30.2	159	28.9

Source: Field Study

Table 4.25 highlights the elements present near the public waste bins or dumping sites. Many of the respondents provided multiple-choice answers. Out of the total respondents 50% have said that they get the odour, 29.1% have said the water nearby is contaminated, 59.8% have said that mosquitoes and insects are present, 45.3% have said that domestic animals are present, 27.6% have said that rats are present, 26.7% have said that birds are present and 28.9 of the respondents have said that scavengers and rag pickers are present near the public waste bins or dumping sites.

E. Environmental Laws: Related to environmental laws, five questions were asked of the respondents during the period of the survey. The responses from the participants are listed in the tables below.

Table 4.26

Awareness of the Solid Waste Management Rules, 2016, Amongst Respondents by Gender.

E18	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	119	50.6	146	46.3	265	48.2
No	116	49.4	169	53.7	285	51.8
Total	235	100.0	315	100.0	550	100.0

Source: Field Survey

Out of the total male respondents, 50.6% of them have said that they are aware of the SWM Rules of 2016, and out of the total female respondents, 46.3% said that they are aware of the SWM Rules of 2016.

Table 4.27

Awareness of the Solid Waste Management Rules 2016 by the Educational Qualification of the Respondents

E18	Education Qualification									
	Below HSLC		HSLC to Higher Secondary		Graduate		Post Graduate		PG and Others	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	2	40.0	68	46.3	89	53.6	55	42.0	51	50.5
No	3	60.0	79	53.7	77	46.4	76	58.0	50	49.5
Total	5	100.0	147	100.0	166	100.0	131	100.0	101	100.0

Source: Field Study

It can be analysed from the above-mentioned Table 4.27 that the respondents are divided on the basis of their educational qualification. Out of the respondents who have completed their studies below HSLC, 40% have said that they are aware of the SWM Rule 2016. Out of the total respondents who have completed their studies from HSLC to Higher Secondary, 46.3% of them have responded that they are aware of the SWM Rules 2016. Out of the total graduate respondents, 53.6% are aware of the rules, and 42% of the postgraduate respondents are aware of the rules. Out of the total respondents who have completed PG and other higher studies, 50.5% of them are aware of the SWM Rules of 2016.

Table 4.28**Efficient Legislation for Environmental Matters by Gender**

E19	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	104	44.3	131	41.6	235	42.7
No	131	55.7	184	58.4	315	57.3
Total	235	100.0	315	100.0	550	100.0

Source: Field Study

Table 4.28 enumerates that 44.3% of all male respondents and 41.6% of all female respondents, respectively, think that there is effective legislation for environmental issues.

Table 4.29**Efficient Legislation for Environmental Matters by Educational Qualifications**

E19	Education qualification									
	Below HSLC		HSLC to Secondary		Higher Graduate		Post Graduate		PG and Others	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	1	20.0	60	40.8	83	50.0	47	35.9	44	43.6
No	4	80.0	87	59.2	83	50.0	84	64.1	57	56.4
Total	5	100.0	147	100.0	166	100.0	131	100.0	101	100.0

Source: Field Survey

Table 4.29 divided the responses of the respondents based on their education qualification when being asked about how efficient the legislation for environmental

matters, according to them, is, and out of the total respondents who have completed their studies below HSLC 20% of them have responded yes to the question. 40.8% of the respondents who have passed their HSLC to Higher Secondary exams have responded yes to the question when being asked whether they think we have efficient legislation for environmental matters. 50% of the graduates have also responded yes, and 35.9% of the respondents have also agreed to the question. 43.6% of the respondents who have completed their PG and other degrees have also agreed with the question.

Table 4.30

Do you know Public Interest Litigation?

E20	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Yes	148	63.0	155	49.2	303	55.1
No	87	37.0	160	50.8	247	44.9
Total	235	100.0	315	100.0	550	100.0

Source: Field Study

Table 4.30 indicates that out of the total respondents, 55.1% of the respondents know about the Public Interest Litigation, and 44.9% of them do not know about the PIL system.

Table 4.31

What are the Main Issues with Environmental Laws?

E21	Gender					
	Male		Female		Total	
	Count	%	Count	%	Count	%
Proper enforcement	102	43.4	113	35.9	215	39.1
Inadequate laws	65	27.7	84	26.7	149	27.1
Lack of awareness among people	174	74.0	222	70.5	396	72.0
Lack of stringent penalties	68	28.9	83	26.3	151	27.5
Others	10	4.3	34	10.8	44	8.0

Source: Field Study

From the above table it can be analysed that out of the total respondents 39.1% of them have said that lack of proper enforcement of environment laws is the main issue in our country, 27.1% have said that there are inadequate environmental protection laws, 72% have said that there is a lack of awareness among the people, 27.5% of the respondents have expressed that there is a lack of stringent penalties and 8% have said that other issues are present regarding the environmental laws.

4.4 Hypothesis Testing: The following hypothesis is tested in the course of the study:

Hypothesis:

H₀ The inadequacy and ineffective implementation of existing environmental laws hinder the environmental sustainability in waste management practices in the state of Assam.

To fulfill the above hypothesis, the negative responses about the Waste Management, Sustainable Development, Environmental Impact, and Environmental laws, the responses have been negatively extracted. The total number of questions from the four categories is 17, which have been selected, and the negative response scores were summed up. The score distribution has been presented in the following table.

Table 4.32

Distribution of Variables for Score Compilation

Dimensions	Variables	Negative Response (out of 550)	%
Solid waste management	B1 knowledge	86	15.6
	B3 trained	433	78.7
Sustainable Development	C6 public dustbin	266	48.4
	C7 container empty	258	46.9
	C8 put away SW	87	15.8
	C9-1 state rusting	52	9.5
	C9-2 smelly	203	36.9
	C9-4 unhygienic	161	29.3
	C10 waste disposal	410	74.5
Environmental Impact	D11 env degradation	501	91.1
	D13 noticed waste	516	93.8
	D14 SW in water	487	88.5
	D15 Burning SW	439	79.8
	D16 SW for health	506	92.0
Solid Waste Managemnt laws	E18 Awareness	285	51.8
	E19 efficient legis	315	57.3
	E20 knowledge PIL	247	44.9

Table 4.33

Range of Score and Frequency Distribution

Range of Scores	Frequency	Percent
1 – 8	182	33.1
9 – 15	368	66.9
Total	550	100.0

Out of 17 questions, 1 to 8 questions were answered by 182 respondents, which is 33.1 percent, and 9 to 15 questions were answered by 368 respondents, which is 66.9 percent. The minimum score is 1 and the maximum score is 15.

Computation of the Z-score from raw scores to set the level of attitude

The total Raw score has been converted to Z-score, the z-score ranges from -0.05 to below set as low level attitude and from $+0.05$ and above set as high level attitude.

Table 4.34

Level of Attitude of the Respondents

Levels of Attitude	Frequency	Percent
Low	260	47.3
High	290	52.7
Total	550	100.0

The low level of attitude is found 47.3 percent and the high level of attitude is found 52.7 percent. The more respondents having the high level of attitude on waste management, sustainable development, Environmental impact, and Environmental laws.

Table 4.35

T-Test – Difference of Attitude between the groups of Low and High level attitude of Respondents.

	Levels of attitude	N	Mean	Std. Deviation	Mean difference	T	Df	P-value
Total attitude score	Low	260	7.48	1.60	-3.92	-31.69	548	.000
	High	290	11.40	1.29				

The mean score of low-level attitudes of respondents is found 7.48 and high-level attitude is 11.40. The mean difference is -3.92. The t score is -31.69 at df 548 and P= .000 has explained that the difference between low-level attitude and high-level attitude is found significant at <1% level.

From the above interpretation, it can be concluded that the hypothesis “*The inadequacy and ineffective implementation of existing environmental laws hinder the environmental sustainability in waste management practices in the state of Assam*” is accepted.

4.5 Analysis of Data of Waste Pickers:

There is a significant engagement of the rag pickers in the waste management sector of the economy as they are engaged in various activities like collection, segregation, and recycling of waste. Thus, there is a need to protect their rights

legally, socially, and economically. Unfortunately, from a legal standpoint, limited development has been made to deal with the waste under the rules framed by the Central Government. Nevertheless, these rules, particularly Solid Waste Management Rules 2016, fail to recognize their rights despite their significant contribution to the waste management of the city.

In Assam, legal measures have not been taken or implemented on a significant scale, and the local government has proven extremely inefficient in integrating the services provided by waste pickers into the state's organized economy. The waste pickers in Assam lack appropriate training and therefore fail to meet the standards set by the 2016 Solid Waste Rules. Inadequacies of safety equipment and skills make them vulnerable and prone to diseases. Further, they are unable to access legal benefits like minimum wage or healthcare, leaving them vulnerable to exploitation. The next section analyses these issues in detail.

Analysis of Surveyed Data

A Survey was conducted to examine the socio-economic and legal issues faced by waste pickers. The present research surveyed eight municipal areas in Assam - Dibrugarh, Tinsukia, Sivasagar, Nalbari, Haflong, Silchar, Bishwanath, and Guwahati. However, during the field survey, no waste pickers were observed in municipal areas like Haflong and Bishwanth Chariali. A total sample of 35 waste pickers was collected, comprising 19 males and 16 females. The collected data are analyzed as follows:

Table 4.36

Age Groups of Sample Waste Pickers

Age group	Male	Female	Total	Percentage
Less than 17	6	3	9	25.71
18 – 30	4	3	7	20
31-40	5	4	9	25.71
41-50	3	6	9	25.71
51-60	1	-	1	2.85
61 and above	-	-	0	-
Total	19	16	35	100

Source: Field Survey

The field survey indicates that the proportion of the minor population in the age group 0-17 is 25.71 percent. The highest age groups of sample waste pickers are recorded in three age groups, such as less than 17, 31-40, and 41-50. The lowest is recorded in the age group of 51-60.

Table 4.37**Educational Qualifications of the Waste Pickers**

Educational Qualification	Male	Female	Total	Percentage
Illiteracy	13	14	27	77.14
Primary	3	1	4	11.42
Middle	1	-	1	2.85
High school	2	1	3	8.57
Total	19	16	35	100

Source: Field Survey

It is found in the field study that 77.14 percent represent the number of illiterate sample waste pickers. 2.85 percent of waste pickers, which falls under the lowest number, represent the middle School level.

Table 4.38**Reason for Waste Picking**

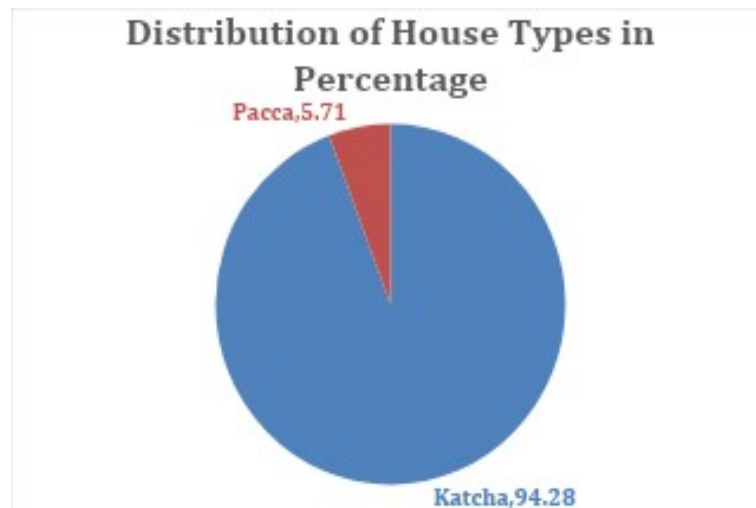
Reason for Migration	Male	Female	Total	Percentage
Soil Erosion	2	1	3	8.57
Poverty	7	4	11	31.42
Unemployment	10	11	21	60
Total	19	16	35	100

Source: Field Survey

It is observed in field surveys that many downtrodden and underprivileged sections of society are engaged in waste-picking occupations due to several reasons, such as soil erosion, poverty, and unemployment. The highest percentage (60%) of waste pickers who are engaged in the waste picking sector is due to unemployment. The lowest percentage (8.57%) is engaged in waste picking because of soil erosion.

Figure 4.3

Types of Houses of Sample Waste Pickers

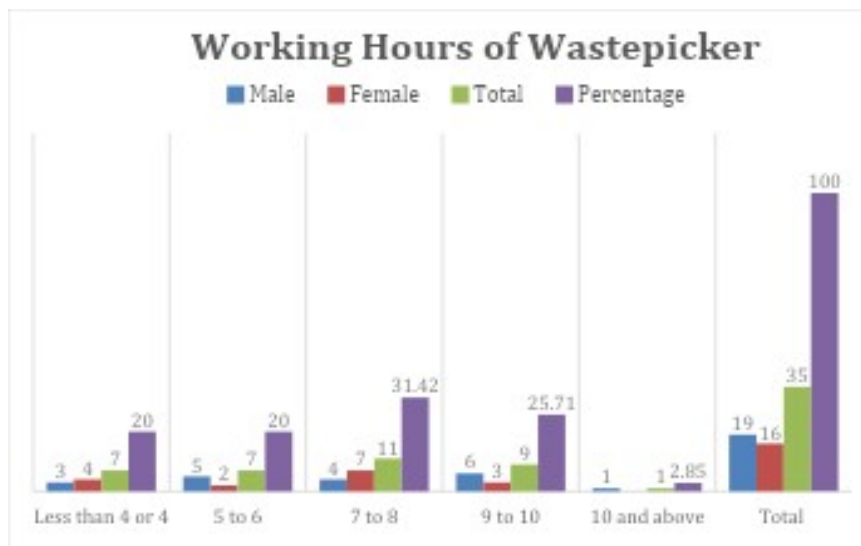


Source: Field Survey

The type of Dwelling house is also a determinant of the people's living level. In the field study, the dwelling houses are divided into two categories, Katcha and Pacca houses. It is observed that 94.28% of the sample waste pickers live in Katcha houses. The lowest (5.71%) of the waste pickers live in Pacca houses.

Figure 4.4

Working Hours of Waste Pickers



Source: Field Survey

The people engaged in waste-picking do not take into account their working hours. They have no fixed working hours, which vary as per the availability of garbage in a particular area. In the data analysis, it has been found that 31.42 percent of waste pickers work for 7 to 8 hours a day. Only 2.85 percent work for more than 10 hours.

Table 4.39

Daily Collection of Waste

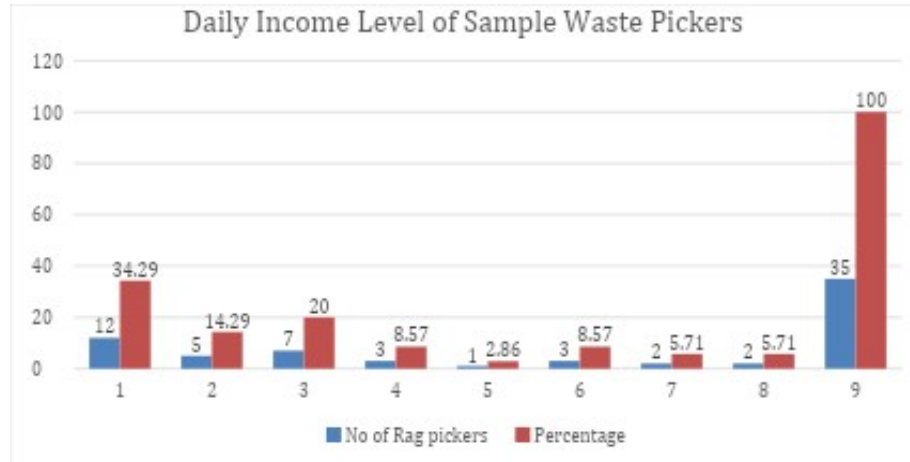
Daily Collection (in kgs)	Male	Female	Total	Percentage
Less than 10	5	3	8	22.85
11 to 20	6	8	14	40
21 to 30	4	3	7	20
31 to 40	1	-	1	2.85
41 to 50	2	2	4	11.42
51 and above	1	-	1	2.85
Total	19	16	35	100

Source: Field Survey

Table 4.39 represents that 11-20 kilos of waste per person/day are collected by 40 percent of the waste pickers. It is also found in the field survey that these waste pickers collect waste without any safety equipment in the dumping sites. The highest amount of waste, 51 kilos and above, is collected by 2.85% of the waste pickers without any safety equipment.

Figure 4.5

Daily Income level of sample waste Pickers

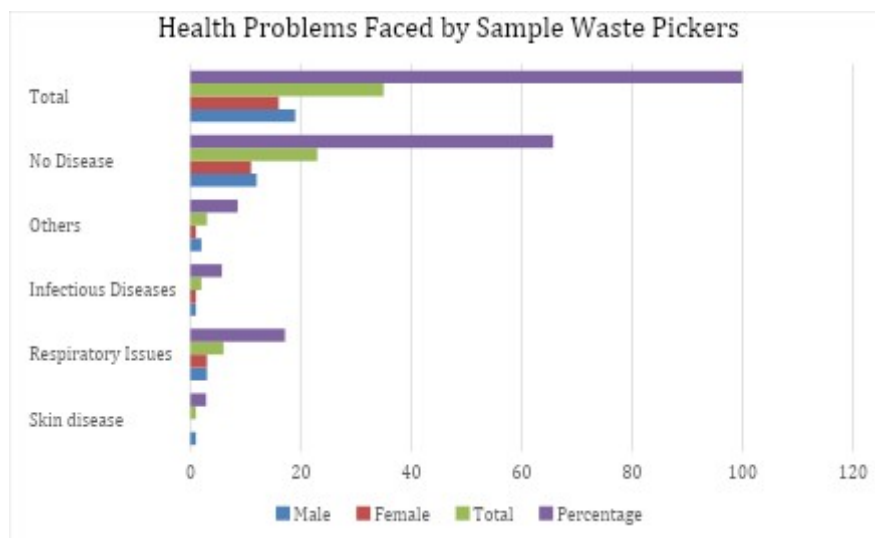


Source: Field Survey

The data analysis states that 34.29 percent of the sample waste pickers daily earn less than Rs 200. It is further found that 14.29 percent of the waste pickers daily earn between Rs 201-250. Only 5.71 % of waste pickers are earning Rs 500 and above.

Figure 4.6

Health problems faced by Sample Waste Pickers



Source: Field Survey

The data analysis shows that 2.85 percent of the waste pickers suffer from skin disease. 17.14 percent of the waste pickers suffer from infectious diseases like the flu and the common cold. 5.71 percent of the waste pickers are suffering from diseases like cancer, diabetes, etc.

Figure 4.7

Social Security enjoyed by Waste Pickers



Source: Field Survey

Social security measures include old age and disability pensions, maternity allowances, sickness benefits, unemployment doles, funeral allowances, children's aid, etc. It is found in data analysis that only 5.71 percent of waste pickers get security benefits from the Assam government.

4.6 Challenges of Waste Management in Assam

The local urban bodies, such as Municipal Authorities in Assam, are facing significant challenges relating to waste handling. These challenges are enumerated under the following heads:

- *Collection:* With regard to collection, the Municipal Corporation of Guwahati, along with other towns, has initiated waste collection on a door-to-door basis of town

waste. Nevertheless, most areas of the town still rely on the old practice of collecting waste from roadside bins, which are placed at different locations.

- *Segregation:* As regards the segregation part, it is virtually non-existent throughout the State of Assam. It is not segregated into organic, recyclable, and hazardous materials. There is also no concept of a separate dustbin for different kinds of waste.
- *Storage:* As regards the storage, the traditional old practice for storing waste is still followed by the majority of the local government bodies. Dustbins are placed at select locations, and waste is collected every 2 to 3 days. In some areas of Guwahati, colour-coded bins have been introduced, in Pachim, Boragaon areas a temporary facilities for storage have been set up by the Guwahati Municipal Corporation.
- *Transportation:* Various transportation vehicles such as Trucks, Tractors, tippers and hand carts are primarily used for the purpose of transportation. There is also a problem of lack of specialized vehicles infrastructure for waste transportation may affect efficiency and hygiene.
- *Processing:* Assam lacks processing facility of waste . However, Dibrugarh district is under construction of a MSW Processing Unit.
- *Disposal:* With the exception of Guwahati city, other local government bodies often resort to using low-lying areas of the city for waste disposal. Which will result in environmental contamination, health hazards, and aesthetic issues.
- *Landfill:* The majority of local government corporations lack well-established and scientifically designed landfill sites for the disposal of waste. The practice of identifying and allocating land for a proper landfill site has been adopted recently in

certain regions, particularly Dibrugarh town, which will address the need for appropriate waste disposal infrastructure.

- *Composting and Incineration Standards:* Throughout Assam, aside from Guwahati city, lacks conspicuous absence of composting and incineration facilities. As a result, the region lacks proper infrastructure for composting organic waste or incinerating waste to reduce its volume. Additionally, standards for treating leachate, the liquid that can result from waste decomposition, are not being met in most areas. This underscores the urgent requirement for the development of composting, incineration, and leachate treatment facilities to ensure sustainable and environmentally responsible waste management practices.

Overall, the state's municipal Corporations are struggling with inadequate waste management practices. There is an absence of door-to-door waste collection methods, transportation problems, disposal sites, and processing mechanisms. These challenges pose significant health and environmental concerns and highlight the need for comprehensive management of waste.

4.7 Best Practices of Solid Waste Management: Since 2017, Indore, India, has held the title of the nation's cleanest city. In addition to encouraging green and sustainable management, the city has handled solid waste in an environmentally responsible way. The city is able to keep its landfill-free and open defecation-free status. Recycling, reuse, and the scientific and sustainable disposal of solid waste have all been given top priority by the Municipal Corporation of Indore. Its segregation techniques involve six-bin waste practices. It is found that there is 100 percent collection as well as disposal of the waste from the city on the same day. It is ranked as the cleanest city seven times in a row under the Swachh Bharat Survey. The IMC has taken the

initiative to convert waste into energy and also practices a mobile composting unit for making compost from waste. In Indore city, more than 50,000 households currently compost their household waste on-site. The system of waste collection includes the use of two bags for storing plastic waste separately.

In a notable feat, the city has established an effective plastic waste management system. Every day, a substantial 8 tonnes of plastic waste are efficiently processed within specialized treatment facilities, yielding 3500 liters of diesel fuel and valuable cement bricks. Moreover, non-recyclable plastic waste find's purpose in road and sidewalk construction through collaboration with the M.P. Rural Road Development Corporation. This groundbreaking approach ensures that all plastic waste generated is managed on the same day, rendering traditional landfill practices obsolete and showcasing the city's resolute commitment to sustainable waste disposal practices and resource utilisation. In 2019, a decisive move by IMC transformed Indore into a landfill-free city. Within just six months, an impressive 1.5 million tonnes of legacy waste were successfully cleared, allowing for the reclamation of 100 acres of land with an estimated value of Rs. 400 Crores. Swati Singh Sambal, a Waste Management Specialist at the UN-Habitat, attributes Indore's remarkable achievements to its robust political and administrative determination. Much of Indore's solid waste problems have been effectively resolved, and the city is still making progress in this area. Indore engaged strategies such as user fees and considerable penalty charges, along with producing revenue from compost and dry waste sales, generating a mutually advantageous arrangement. Furthermore, Indore's commitment to maintaining its reputation as the cleanest city in India further drives its efforts, which are backed by political will and public support (Upadhyay & Bhaskar, 2022).

Chapter – 5

Role of Judiciary in Waste Management in India

5.1 Introduction

The Indian judicial system's primary role is to preserve and promote sustainable development. The major obstacle in protecting the environment is industrialization; however, industrialization is necessary for the development and progress of a country, as it enables financial independence in a country. To tackle this, it is prudent to adopt a balanced approach. India has several environmental regulations, such as the Forest Act (1927), Wildlife Protection Act (1972), the Environment Protection Act (1986), etc.

They are inadequate to cater to the present environmental concerns; therefore, judicial interpretation plays a crucial part. The Indian judiciary is responsible for providing environmental justice in India. It occupied a revolutionary stand in rendering constitutional provisions and formulating environmental principles.

The Supreme Court (SC) of India has issued several important decisions, such as *M.C. Mehta v. Union of India* (1996), *M.C. Mehta v. Kamal Nath* (1996), etc.

It includes environmental theories such as the Precautionary Principle, which holds that environmental harm should not be prevented in the absence of scientific proof. The public trust doctrine states that the state has a duty to safeguard natural resources for the benefit of the populace as a whole. The development of environmental law was influenced by the public trust concept, the polluter pays principle, the precautionary principle, and others by addressing the shortcomings.

Also, Judicial activism has promoted environmental governance by providing sound legislation and policies, keeping in mind human health and sustainability interests (Kumar & Sharma, 2024).

5.2 Right to a Healthy Environment and Development

The UDHR and UNEP report "What is the Right to a Healthy Environment" state that the terms "right to life" and "right to a healthy environment" lack a clear international definition. However, by understanding both the procedural and substantive elements, one can understand what the phrase "Right to a Healthy Environment" means. A healthy environment is created by combining procedural rights with substantive rights. It offers an in-depth understanding of how environmental degradation leads to human rights violations. It also explains how to encourage improved environmental stewardship through a positive cycle of feedback. It increases environmental awareness with regard to implementing this right into a country's legislative framework. It also helps to spread awareness about to environment at a societal level. It improves implementation and execution in nations where the right is already acknowledged. It recognizes that the commercial sector has a greater responsibility to maintain a green environment across supply chains. The UN has presented sixteen principles on human rights and the environment, some of which are as follows (United Nations Human Rights Council, 2018):

- States should abide by the Human Rights and also, and they must protect them.
- To have a sustainable environment, the state should protect from harassment, threat, violence, etc.

- The state has to create awareness and educate them relating to environmental matters
- Appropriate remedies for environmental human rights abuses.
- Strict enforcement of environmental standards, which will apply to both private and public bodies.
- Mutual Cooperation between the states is required to protect and implement legal frameworks that prevent trans boundary and global environmental damage that affects human rights.
- In case of an emergency, provision for extra protection should be taken to tackle the environmental damage.

In the matter of **Charan Lal Sahu v. UOI (1990), AIR 1940, 190 SCR (1) 206**, it is stated that the concept of the Doctrine of Parens Patriae. In paragraphs 33,34,35 of this case, the court explains the applicability of the Parens Patriae doctrine, which allows the government to act in a fiduciary capacity for people. In its parens patriae perspective, the Supreme Court of India asserts that the Union of India has the power to take action for the benefit of the victims and defend their rights. In the earlier case of *M.C. Mehta v. Union of India (1987 AIR 1086)*, the principle of absolute liability was established, and the verdict was upheld. The court highlighted that those businesses involved in unsafe operations shall have to pay damages, regardless of whether they were negligent or at fault. This judgment sets a precedent for absolute accountability for businesses that contain risky operations.

This decision makes reference to the idea of absolute accountability for businesses engaged in risky operations, asserting that the owner of a risky business is under an obligation to compensate all the victims. Another remarkable feature of this case is that it placed importance on the concept of public interest liability, as this will be a

significant instrument for defending those people who are unable who are not able to seek a remedy. The Court preserved the function of Public Interest Litigation (PILs) in deciding matters that involve public interest, specifically in environmental and human rights cases.

In the case of **Subhash Kumar v. State of Bihar & Ors 1991 AIR 420**, some important ideas in the field of environmental law were established. The extension of the right to life includes recognition that a person's quality of life goes beyond their basic existence. Because of this, people should have access to clean water and an environment free of pollution. Secondly, the judgment stresses the significance of PIL. Thirdly, this case cites the importance of public health, which is preserved in the DPSP. Fourthly, this case recognizes that although development for economic growth is necessary without compromising environmental interests.

M.C. Mehta v. Union of India 1991 SCR (1) 866 1991 SCC (2) 353. The ruling in this instance highlights how the DPSP, Fundamental Rights, and Fundamental Duty, all acknowledge environmental concerns. The ruling emphasizes that the right to a healthy environment has an unbreakable connection with the right to live in a pollution-free environment. It also highlights the significance of SD and the polluter pays principle, which holds that people who violate environmental laws or regulations or cause environmental harm have a duty to make amends. It also brings to light the precautionary principle that encourages precaution when there is a lack of scientific information about the probable invention that may be harmful. It acts as an instrument for the purpose of decision-making (European Parliamentary Research Service, 2015). Lastly, the judgment emphasizes public awareness.

M.C. Mehta v. Union of India & Ors (1996). Citation: I.A.29 [W.P(C) No.4677/85]. In this case, the polluter pays principle and the precautionary principle

were seen as essential elements of sustainable development. In this case, the following behaviours are covered by the precautionary principle: (i) actions done by statutory and governmental authorities (ii) the lack of a scientific threat cannot be used as a justification for inaction if there is a serious ecological hazard.

M.C. Mehta v. Union of India & Ors., 1987 SCC (1) 395. The SC describes the idea of absolute liability for any environmental harm in this case. In simple terms, absolute liability means any person carrying out trade or business that contains dangerous or hazardous goods, and such goods have the power to seriously damage the environment, then the person carrying such goods is obliged to be accountable, irrespective of whether due care has been taken by them or not.

In the case of **A.P. POLLUTION CONTROL BOARD v. PROF. M.V. NAYUDU (RETD.) AND OTHERS (1999) 2 SCC 718**, This case talked about SD as a vital instrument to conserve the environment. The primary takeaway from this is that Article 21 guarantees the fundamental right to a pollution-free environment. Without this right, the right to life is insufficient since citizens' health and well-being cannot be attained. The right to liberty, which includes protection from environmental hazards and the provision of environmental justice, was also acknowledged in this instance. The Polluter Pays Principle, the Precautionary Principle, and Sustainable Development are the three pillars of the right to a healthy environment. When rendering a decision pertaining to environmental issues, these concepts are acknowledged.

Thus, in this case, the scope of the judiciary is expanded by not limiting itself to deliver judgment as per the remedies contained in Article 21 of the Constitution and by applying “*unused provision of the law*’ for the public good (Venkateswarlu, 2013).

5.3 Judicial Remedies available for the protection of the Environment:

The legal system in India ensures environmental protection, promotes the nation's holistic growth. The Indian legal System has developed a number of legal procedures that have been used to resolve environmental issues, including the polluter pays concept, SD, the public trust doctrine of environmental protection, etc. The following are a few of the main legal remedies:

5.3.1 Public Interest Litigations or PILs :

It is an instrument through which citizens or organizations can bring up an issue before the court, representing the affected community or the general public as a whole. Many environmental issues are brought up in the court through the medium of PIL. For example, to protect the Ganga River from pollution, a PIL was filed by MC. Mehta, which is referred to as *M.C. Mehta v. Union of India & Others 1988 AIR 1115* of 22 September 1987.

5.3.2 Writ Petition:

A writ petition is an official request for a judicial remedy that is submitted to the Indian SC or HC. The five types of writs are Quo Warranto, Habeas Corpus, Mandamus, Certiorari, and Prohibition.

- A Writ of Habeas Corpus is filed whenever an activist or anyone else is taken into custody in connection with an environmental protest.
- This writ assists the environmental activist or anyone else opposing a development project that is negatively impacting the environment in determining whether the detention is lawful (Bajoria, 2024).
- In writ of Mandamus, the public officials who did not perform their duty relating to environmental matters are compelled to perform it.

- In environmental jurisprudence, the Writ of Certiorari is used as an important tool to appeal to a higher authority to reverse a decision that has already been made by the subordinate court, which hampers the environment.
- Writ of prohibition is used as a powerful tool in environmental jurisprudence as it prohibits the lower court or quasi-judicial body from overstepping its jurisdiction.
- The writ of quo warranto checks the authority holders' position.

5.3.3 Compensation and Damages:

The words "compensation" and "damages" refer to giving financial assistance to those who have been harmed by pollution or environmental degradation.

The Polluter Pays Principle is regarded as a crucial environmental jurisprudential principle in the context of damages and compensation. According to this principle, the parties causing environmental damage are required by courts to compensate the victims.

5.3.4 Courts and Tribunals:

Environmental degradation-related matters are handled by courts and specialized tribunals such as the NGT. It is a specialized court dealing with environmental matters. It also considers appeals that restrict probable environmental damage.

5.3.5 Injunctions:

The courts grant temporary or permanent injunctions to stop activities that are likely to create environmental damage. In a number of rulings, the court has issued injunctions to safeguard the environment against industrial pollution and development projects that could jeopardize environmental sustainability.

5.3.6 Restoration and Rehabilitation Orders:

Restoration in environmental jurisprudence means to recover the ecosystem and biodiversity to its original condition. Rehabilitation, on the other hand, aims to improve the specific functions of the ecosystem even if restoration is not possible. To remedy the harm done to the people or the ecosystem overall, the courts may issue a restoration or rehabilitation order. The Supreme Court issued a restoration order for environmental conservation in the *Vellore Citizens' Welfare Forum v. Union of India* case (AIR 1996 SUPREME COURT 2715).

5.3.7 The Concept of Strict Liability and Absolute Liability:

This principle implies that when hazardous substances escape and cause harm, the owner or controller of those substances will be liable for the ensuing damage, irrespective of negligence or fault on their part.

This concept is embodied in both Strict and absolute liability; however, in the case of the former, certain exceptions are available in the latter, wrongdoers are liable for their actions without any exceptions. *M.C. Mehta and Anr vs. Union of India & Ors* 1987 AIR 1086, 1987 SCR (1) 819 is the landmark case for absolute liability, while *Rylands v. Fletcher*, [1868] LR 3 HL 330, is the landmark case for strict liability.

5.3.8 Public Trust Doctrine:

Its foundation is the notion that the government acts on behalf of the people since it is their guardian. Therefore, it is their responsibility and duty to protect resources such as water, land, forests, etc. In *MC Mehta v. Kamal Nath* (1996), W.P.(C) No.-000182-000182 - 1996, the court acknowledged the public trust theory as a means of limiting the Beas River's flow.

5.3.9 Contempt of Court:

Another important judicial remedy is the contempt of court, where the court exercises its powers to enforce environmental orders, directions, judgments, etc. Thus, the person not obeying the order of the court shall be punished as per the contempt proceedings.

5.3.10 Judicial Commissions and Expert Committees:

The court establishes expert committees and judicial commissions to promote environmental conservation. It is made up of specialized professionals who monitor ongoing environmental operations and offer advice and recommendations.

5.4 Important Judicial Pronouncement Relating to Environment:

Urbanization results in congestion, and there is a rise in population growth and migration. People belonging to rural areas are migrating to cities and towns for better livelihood and employment. Rapid growth of the population leads to increased exploitation of resources of nature, converting vacant and unused lands for the developmental process. This is becoming a serious issue relating to environmental degradation; therefore, a balanced approach should be adopted to handle development while retaining a clean environment. The SC and the HC, in their numerous judgments, focused on a balanced approach for development without harming the environment in *Tarun Bharat Singh v. UOI and Others 1993 SCR (3) 21*, the SC declared a ban on all mining activities in the sanctuary. Indian courts have provided various judgments with regard to environmental issues relating to towns and cities on the basis of global sustainable development criteria. Important Judicial Pronouncements Relating to the Environment are as follows:

Ratlam Municipality v. Vardichand AIR 1980 SC 1622

This petition stated that there were public health and sanitation issues in Ratlam town because of the improper management of the drainage system. In light of this, the Magistrate gave Ratlam Municipality a period of six months from the issuance of the decree to create an efficient policy for the appropriate administration of the drainage system. The Municipality appealed to the HC, stating that they do not have sufficient budget to implement the decision. Nonetheless, the HC upheld the Magistrate's ruling and rejected the municipality's argument. The SC received a re-filed lawsuit claiming insufficient funding for sanitary and drainage systems. Since the municipality's principal responsibility is to provide public health and sanitation, the Supreme Court rejected the plea.

The HC's ruling that suitable steps should be taken to upgrade the facilities within six months was upheld by the Supreme Court. This case emphasizes how crucial Article 38 of the Indian Constitution is for safeguarding citizens' social interests.

Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh, AIR 1985 SC 652; 1985 SCR (3) 169.

The Rural Litigation case of 1985 is also known as the Dehradun Valley case and Doon Valley case. There was limestone mining between 1955 and 1965 in the Doon Valley area, as a result of which there was deforestation, a decline in the output of food production, as well as a reduction in the farmland. Additionally, the quality of the water and its availability in the region declined. Ecological imbalance in the area compelled people to pursue alternative occupations, leaving their agricultural lands. On 11th August 1983, SC appointed an expert committee in this regard. The judgment

of the case highlights that ecological sustainability cannot be compromised at the cost of economic growth.

M.C. MEHTA v. KAMAL NATH and OTHERS W.P.(C) No.-000182-000182 – 1996

The Span Motels Private Limited company's environmental degradation is the subject of this case. The SC noted that the government had violated the public trust doctrine to safeguard the earth's resources for the benefit of the populace, and that the motel's actions had damaged the environment and altered the water flow. The Himachal Pradesh PCB was instructed to oversee the region's garbage disposal. This rule set a precedent for the application of the Public Trust rule to safeguard the environment against unauthorized access and harm.

Research Foundation for Science v. UOI and Ors, 2007 AIR SCW 5851, (2007) 59

It is a case of dismantling a luxurious ship known as “Blue Lady” at the beach of Alang, Gujarat in August 2006. In the dismantling process, several issues were raised, such as the safety of the workers, the presence of radioactive substances, and asbestos. The Committee of Technical Experts (TEC) was established by the SC. The major goal of this group was to analyze primarily three topics such as (i) infrastructure at Alang, (ii) environmental safeguards, and (iii) health hazards. On 10th May 2007, TEC submitted its reports addressing these issues. The report of the TEC stated that the competent authority will look after the safety and environmental guidelines as directed by the TEC. It was certified by the Atomic Energy Regulatory Board (AERB) that the ship Blue Lady does not contain radioactive materials. The TEC studied the recycling plan. The report submitted by TEC was accepted by the SC. It is directed to adopt the SD without hampering the ecosystem. This case also

affirmed the decision given in *Vellore Citizens' Welfare Forum v. Union of India* (1996) 5 SCC 647 about the importance of SD, international conference, etc.

T. Damodhar Rao & others vs. The special officer, S.O. Municipal Corporation 1987 AP 171

When a petition was filed asking whether it was legal to use a piece of land for residential building construction when the development plan was for a recreational area, the court in this case recognized Article 21 of the Indian Constitution as an environmental factor. The court ruled that the government could not violate the development plan because it is legally binding for a particular use. The court also ruled that open spaces are considered essential for a healthy environment under Article 21 of the Indian Constitution.

5.5 Important Judicial Pronouncement Relating to Waste Management

In waste management, the decisions given by the judges are considered important from the point of legal research and environmental governance. Courts, in general, explained and interpreted current statutory laws and safeguarded their enactment to achieve a healthy environment and public health. The judiciary, in its numerous judgments, made an effort to fill the gap relating to the provision of management of waste. The judicial pronouncements relating to waste management reflect the complicated nature of the environmental regulations, such as the EPA Act of 1986 and the various Rules contained in this Act, such as the SWM Rules of 2016. Here, the interpretation of the courts serves as a vital function in understanding the vagueness of these laws. These interpretation of the courts is taken as the precedent for future cases. Public Interest Litigation (PIL) has shaped environmental law in a way that allows the conscious public and organizations to raise their voices in pursuit

of environmental justice. At the same juncture, some of the PILs filed by citizens are concerned about improper garbage disposal.

Original Application No. 286/2021 in the matter of News item published in The Indian Express dated 20th April, 2022, titled "7 Charred to death in fire near Ludhiana dumpsite"

The Indian Express newspaper published a report titled "7 Carried to death in fire near Ludhiana dumpsite" on April 20, 2022, which the National Green Tribunal has taken suo motu. In this case, 7 members of the waste pickers' family died due to a fire breakdown in the dumping site on the Tajpur road. The NGT noted that Punjab's state government had seriously failed to manage solid waste, especially when it came to legacy garbage. The legacy waste in the dumping site caused health and environmental hazards. The tribunal's earlier order, O.A. 606 of 2018, has not been complied with. As a result, following the legacy waste tragedy, the National Green Tribunal took independent action under O.A.286 of 2022, directing the state to remove the legacy waste to avert further tragedies. The tribunal determined that the government's carelessness results in ecological damage and a violation of the right to a clean environment. Therefore, the Punjab Government was directed to take instant action for bio-remediation, waste-to-energy solutions, and strict compliance within the deadline, which will follow up with a strict penalty for non-compliance. In order to check the compliance of this order, the NGT has constituted a monitoring committee.

Some of the important elements of this case are as follows:

- The NGT's creation of a monitoring committee
- The CPCB was directed to inquire about the dumping sites and to provide a report, and to provide a follow-up action.

- Monitoring and reporting committee for compliance with environmental standards.
- Public accountability for the mismanagement of waste.
- Importance of proactive measures to avoid environmental hazards.

Sanyogita Singh v. Government of Uttar Pradesh & UPPCB, Original Application No. 404/2022, National Green Tribunal (NGT), Principal Bench, New Delhi

In this case, the question of whether it is appropriate to build the Construction and Demolition Waste Facility in a green belt area was taken up by the NGT through suo motu. The *Lal Bahadur vs. State of UP & Others, (2018) 15 SCC 407* ruling, determined that converting the green belt for residential use is against Articles 21, 48A, and 51A(g) of the Indian Constitution, was cited by the NGT in its consideration of this case. The *Agins vs. City of Tiburon, [447 us 255 (1980)]* and *Bangalore Medical Trust v. B.S. Muddappa & Others, (1991) 4 SCC 54* decisions, which acknowledged green belt areas as having a public purpose and forbade their conversion for other purposes, were cited by the NGT. Using this justification, the NGT halted construction in the green belt and enforced the "polluter pays" principle, fining the offender Rs. 5,00,000.

Indian Council for Enviro-legal Action and others v. Union of India and others, 1996 SCC (3) 212

The ruling states that the offenders are held accountable by both the polluter pays concept and the absolute accountability principle. It took fifteen years for the judgment to be put into effect, even though it was rendered the same year the lawsuit was filed. It was regarded as the first case founded on the polluter pays

theory. In India, major environmental legislation was passed after the Stockholm declaration of 1972. This case provided relief to the victim through the help of compensation.

**Paldan Phunchog v. State of Himachal Pradesh &Ors, Original Application
No. 758/2022**

In this case, the main concern was illegal solid waste disposal in the gram panchayat region, which caused unpleasant odors, garbage littering, water contamination, and health risks. It was also stated in the case that within 15 to 100 meters of the Waste Management Unit, there are educational institutions. Due to this waste management unit student suffered from health problems. The NGT determined that the Municipal Council of Manali was grossly negligent in its Solid Waste Management practices. The NGT found that the Municipal Council operated without mandatory authorization, contravened SWM Rules 2016, had no waste segregation and illegal dumping, no material recovery facility, failed to process waste, legacy waste that was not bio-remediated, contaminated the River Beas, and a non-functional waste-to-energy plant.

The NGT stated that the municipal council has to pay 4.6 crores as environmental compensation. The NGT also imposed criminal prosecution on the officials of Municipal Council, District Magistrate, and Urban Development Dept. under Sections 15, 16, 17 & 19 of the EPA, 1986. Apart from it, the NGT also provided remedial measures like the environmental rejuvenation within 2 months and monthly monitoring by the Himachal Pollution Control Board.

B.L Wadhwa vs Union of India AIR 1996 (2) SCC 594

It was held that non-viability of staff and lack of funds cannot be the grounds for not performing its statutory duty. Concerning solid waste management, the court issues the following directions :

1. All the hospitals and the nursing homes that have above 50 beds and above shall install incinerators.
2. Private hospitals and nursing homes of Delhi were directed to arrange for garbage disposal.
3. Awareness about waste management through Doordarshan and through announcements.
4. The Secretary, Minister of Defence, is required to provide tippers to the MCD as soon as possible.
5. The Development Commissioner is directed to transfer the alternative landfill sites located near Badarpur and Mandi village to the Municipal Corporation of Delhi within three months.
6. It is directed that the Delhi Government should hand over the areas, namely Jaitpur/Tejpur and Mandi landfill sites, to the Municipal Corporation of Delhi within 3 months
7. Revival of the compost plant at Okhla and to start its operation.
8. Afforestation work should be undertaken from 1st April 1996 onwards.
9. Installation of an additional garbage collection centre within four months.

**Almitra H. Patel v. Union of India And Ors, Writ Petition W.P.(C) No.888
OF 1996**

This judgement ordered the formation of an eight-member committee in Class-I cities with a population of lakhs or above. This committee was given the authority

to oversee all facets of SWM in urban areas and investigate garbage disposal and treatment methods.

It also monitors the municipality's bylaw implementation, establishes a timeline for its completion, and examines the rules and guidelines pertaining to solid waste management. The SC instructed the relevant State Governments, including the Union Territories, and local authorities to support the committee's effective operation and to list this issue by July 20, 1998.

**Almitra H. Patel v. Union of India and Ors, AIR 2000 SUPREME COURT
1256**

The court stressed in this case that the state of Delhi has not followed the fourteen guidelines set forth in the solid waste handling and management case of Dr. B.L. Wadhwa v. Union of India and Ors. [1996]3SCR80. This case also showed that household garbage and sewage are the sources of solid waste. The lack of judicial magistrates to effectively enforce the littering issue was brought to light by this case.

The court ordered the Delhi Municipality to abide by the relevant Act provisions, such as the DMC Act of 1957, etc. The court also applied the idea of paying the offender for littering.

**Varinder Malik v. Ministry of Local Govt. Punjab &Ors (Original
Application 524/2024)**

In this case, the main issue was the creation of a dumping ground. The dumping ground consists of waste which is all kinds of unsegregated waste, including organic, inorganic, medical, hazardous, wet, domestic, dry, nonrecyclable, biomedical, etc. This waste disposal created foul smell, resulting in air pollution and also became the breeding ground of mosquitoes, rodents, and other insects creating

a health hazard and thereby spreading numerous diseases like typhoid, dysentery, cholera, etc. On 10 May 2024, the NGT stated that there had not been compliance with the environmental norms and issued a notice to the respondents. In response to the notice, the PPCB has submitted its report stating that unsegregated waste is dumped at the site of the model town through the help of hand pulled carts. The Municipal corporation has not provided with dustbins or compactors. Apart from that solid waste is dumped in in open and in found in various sites of the city.

The Municipal Corporation of Jalandhar has been fined Rs. 4.5 crore by the PPCB for violating the SWM Rules of 2016. The applicant, using a photograph, claimed that even though the previous location was clear, the trash had been moved 100 meters away. The Municipal Corporation said that the waste had been cleaned up and cleared. The Municipal corporation was directed to clear the dump within a period of four weeks ensuring that there should be no dumping takes place is both the sites. Lastly the NGT directed the PPCB to ensure that environmental compensation received from the Municipal Corporation should be used for restoration measures which is beneficial to the environment, within 6 months of the order dated 04.08.2025.

Nand Lal v. Dhermendra Tomar &Ors, Original Application 527/2022

The major problem in this lawsuit was to obtain an issuance for illegal garbage dumping in various Delhi streets. The NGT, to inquire into this matter, had constituted a committee via order dated 22.07.2022. During the investigation, the Delhi Pollution Control Committee found that waste was dumped plot near Rampal Chowk, Sabhapur Village, which spread over several streets. The Municipal Corporation of Delhi has stated that the area falls outside its jurisdiction and the work is carried out by the Irrigation and Flood Control Department. The NGT said that it is

the Delhi Municipal Corporation's legal duty to handle Solid Waste in accordance with the SWM Rule of 2016, as well as the SC previous waste management judgment, even if the area is prohibited. Both the landowner and the Irrigation and Flood Control Department received ten lakh rupees in compensation from the Delhi Pollution Control Committee. The amount imposed on the violators was final since the compensation was not contested.

5.6 Powers of the Guwahati High Court

The Gauhati High Court has original, appellate, supervisory, and territorial jurisdiction, as granted by the Indian Constitution. On working days, the first session of the court starts from 10:15 AM till 1 PM, and the second session begins from 2:30 PM till 4:30 PM. Honourable Chief Justice of Gauhati High Court presides over the single, division, and full benches. The High Court Registry notifies of the matters related to the daily cause list (Gauhati High Court, n.d.).

The Court can interpret various laws to maintain proper waste management practices and promote a healthy environment. The Court also exercises judicial activism by interpreting laws, providing justice, and protecting the rights of citizens. Sometimes the court exercises judicial activism by going beyond the letter of the law to deal with social issues through the help of PIL or Suo motu cognizance.

The various government agencies are directed by the court to fulfil their responsibility to manage waste effectively.

Wing Commander Utpal Barbara and Others v. State of Assam and Others, AIR 1999 GAUHATI 78

In this case, the Kamrup District Magistrate had issued a ban on polythene bags under section 144, stating that Polythene bags cause environmental degradation by issuing an order dated 5th July 1998. The polythene bag manufacturer challenged

the decision, arguing that it went against Article 19(1)g of the Indian Constitution. The Guwahati High Court reversed the magistrate's decision, stating that although it acknowledges environmental concerns, the emergency authority granted by Section 144 of the CrPC cannot be used to address plastic pollution in the long run.

SRI ANIT CHETRI and ORS v. THE STATE OF ASSAM AND ORS
(Case No.: PIL/50/2016)

This is an ongoing case relating to the issue of mismanagement of waste in Assam. The case highlighted the direction given by the NGT in 2017 about the Application No.199/2014, which directed both the State and Union Government to manage the waste effectively. Amicus Curiae pointed out that the SWM Rules 2016 require to constitution of a State Level Advisory Board under Rule 23 of it and also require to framing of policy under Rule 11. However, he stated that whether the advisory board is created or not is unclear. Although the case highlights the current situation of management of waste in Assam, this case lacked important authorities as its party such as the MoECC, CPCB, PCB of Assam, and Housing and Urban Affairs Department, Assam. Therefore, the Gauhati High Court directed to impleading of the respondents and also directed the newly added respondents to file an affidavit addressing the issue. This case is important as it highlights the importance of PIL to enforce the Solid Waste Management in Assam. It also highlights the will of the judiciary in Assam to ensure proper oversight and accountability.

5.7 Role of the National Green Tribunal in Environmental Matters in Assam:

It is established under the NGT Act, 2010, and it operates on the basis of natural justice. It includes various matters of environmental protection, conservation of forests, enforcement of environmental rights, awarding compensation, etc. In order to grant environmental justice to all, it accepts letter petitions that do not require a

formal legal representative for environmental violations. In order to save time, it manages its response via email. It also appoints expert committees to investigate and monitor compliance with its order. It intends to resolve its concerns within six months. The NGT receives a large number of matters from the SC involving solid waste management. For instance, Original Application No. 199 of 2014, dated 3/11/2014, has been forwarded to NGT for additional waste management-related action. The SC used Civil Writ Petition No. 3727 of 1985 to move Original Application No. 200 of 2014 in a similar manner. This case is related to the pollution of the Ganga River due to solid and liquid waste. Further, in the case of *Paryavaran Suraksha Samiti & Anr. v. Union of India & Ors.* Original Application No. 593/2017. In this case, the SC has transferred a case that is W.P. (Civil) No. 375/2012 to the NGT. The SC had vested the NGT with the power of monitoring the industries and local bodies, whether they are properly setting up STPs/ETPs/CETPs by 31.3.2018, to check pollution. Through orders dated 22.12.2016 and 02.01.2017 in OA 199/2014, NGT has also mandated that open burning of plastic waste be prohibited, with assistance from the SPCB, PCC, local bodies, and intellUrban Development Departments (Central Pollution Control Board,2017).NGT monitors the waste management in Assam through its instructions and orders.

In the matter of **Rohit Chaudhary v. Union of India, Original Application No. 38/2011**, for example, the NGT for environmental protection has intervened multiple times. The Numaligarh Refinery Limited (NRL) in Assam violated environmental regulations and caused environmental damage, which was the primary issue in this case. The NGT prioritized ecological integrity over industrial expansion in this instance. It used the precautionary rule, and the Sustainability Principle.

In the **Original Application Number 606/2018** dated 31.08.2018, the NGT stated that although the revised rule on solid waste management was framed in 2016, there are several deficiencies found in the implementation. The NGT has created a three-tier system. Despite the NGT's directive in the order dated 22.12.2016 in O.A. No. 199 of 2014, the States and the Union Territories are still far from adhering to the 2016 Rules.

It is also stated in the original application dated 31.08.2018 that the majority of the states of India are not dealing with the handling of legacy waste properly, which is creating environmental disasters in most of the cities. This original application also praised some models of waste management, like the Indore, Ambikapur, Goa, and Udipi. It also emphasized the following recommendations put out by MoHUA:

It is important to think about properly segregating waste at the source.

- For the problem of land acquisition, decentralized processing is encouraged.
- To cater to financial constrain, collection of user fees, and penalties for violations.
- In case of a lack of capacity, hiring experts will be beneficial.
- The non-recyclable and dry waste should be utilized in the cement factory and in road construction.

The MoHUA also suggested parameters like residential collection of waste, segregation at source, dust bins and container for storing waste at every 50-100 meters, transfer stations in areas where the population is above 5 lakhs, separate transportation and GPS facilities where the populations is above 5 lakhs, twice daily sweeping in all public and industrial areas, decentralised waste processing for bulk

waste generators as per SWM Rules 2016, spot fine for littering, citizens grievance redressal etc.

The NGT for smooth monitoring has created regional monitoring committees at the zonal level. Assam falls within the East Zone of Kolkata. In this order, the NGT ordered that all the states must submit their action plan on Solid Waste Management by October 31, 2018, and this plan must be fully effective by December 31, 2019.

Original Application No.606/2018 (IA No. 163/2021, IA No. 299/2024 & I.A. No. 20/2025) (In respect of State of Assam)

The NGT brought attention to a few shortcomings in Assam's waste, both liquid and solid handling system. Assam has just 594 tons of waste processing facilities; it was claimed that the estimated amount of solid waste created in 96 ULBs is 1,847 TPD. Additionally, the State has suggested processing 2,541 tons of garbage, but there are no specifics, deadlines, or plans to support this proposal. Some of the small towns are left out of the proposed plan, although these smaller towns acknowledge solid waste management problems. Only 13.98 lakh of legacy waste is remediated out of 33 lakh MT.

Appeal No. 11/2018 Rohit Choudhary v. Union of India &Ors

The lawsuit raised questions about whether Numaligarh Refinery's environmental permit for the bamboo-based bioethanol project was legitimate. The appellant argued that the said project falls within the No Development Zone as per the notification given on 5th July 1996. The Appellate also argued that this project will create air pollution and will lead to excess water utilization beyond the permissible limit. It was held that the notification dated 5th July 1996 is not prohibitive but regulatory in nature. In addition, this project will generate green fuel, which is a

national programme. Considering the environmental benefits, the appeal is dismissed in this case.

5.8 Conclusion

The Indian judicial system holds a pivotal position in shaping and interpreting the SWM laws in India. The task of handling environmental disputes is vested in the NGT after its inception. This tribunal acts upon the principle of natural justice. It has been observed from the above-mentioned cases that the principles of environmental laws, such as compensation, Restoration and Rehabilitation, strict and absolute liability, etc., are the cornerstones in determining the issues related to solid waste management. Although relief is provided for environmental disputes however certain implementation failures are observed in the above-mentioned cases.

Chapter – 6

Conclusion

Modernization, urbanization, industrialization, and the widespread consumption of goods and services have all contributed to waste management being a significant concern in the global economy. Numerous international conventions, conferences, summits, and declarations have been conducted globally to address issues of management of waste as a whole.

This concept of SD was popularised by the Brundtland Commission in 1987. In Assam, SD is observed as a crucial pathway towards achieving the vision of “ASSAM-2030”. The State Government of Assam acknowledged the 17 SDGs that the UNGA had endorsed in 2015.

The concepts of duty and right are interdependent. There is always an underlying duty associated with a right. There are a number of government programs for waste management, such as the Assam Municipal Development Project, which offers a guaranteed water supply with a sewage connection, green space development, and pollution reduction through the use of public transportation. Despite having a budget, this program did not receive approval from the Central Government, so no funds were approved.

The full life-cycle of garbage, from its creation to its ultimate disposal, is included in waste management. Following the old methods, it was found that waste was handled by burning and landfilling, which poses a major risk to the environment.

Instead of encouraging sustainable management, traditional methods like open burning and trash disposal are no longer practical because they will worsen the environment by contributing to climate change, global warming, resource overuse, and air, liquid, and solid pollution. Waste management policies urgently need to be changed to maximize resources, recover from environmental deterioration, and preserve the ecosystem.

The geographical area of Assam is 78,438 square kilometres, which is split into 31 districts, 123 revenue circles, and 214 towns. Amongst these townships, 88 are statutory towns, and 126 are census towns. Assam has a total of 26,395 villages, and it consists of 31.2 million people as per the 2011 Census of India. The most significant difficulty facing the entire state of Assam is effective garbage management. With fast urbanization and an increase in population, the consumption level has expanded to a substantial amount. Challenges such as inefficient garbage collection, insufficient transportation, and improper disposal can be seen in the state economy of Assam. Improper waste disposal leads to environmental degradation in the whole state, which not only affects the aforementioned state but also impacts the entire country, thus resulting in climate change.

The MoEFCC is in charge of waste management in India. . The responsibility is carried on by the CPCB as well as the SPCB to ensure efficient enforcement of the rules that were set up by the MoEFCC. Waste management involves dealing with the waste or garbage from the point at which it is generated to the point at which it is processed. Proper waste management is prudent to create a sustainable environment so that we are in a pollution-free environment. Dealing with the issues of waste is indeed a challenging task, especially when it is a developing country. The task of

waste management includes collection of trash, segregation, transportation, processing, disposal, handling, and monitoring different waste.

The major goals of sustainable management of waste are to make as little waste as possible. It leads to a clean environment and takes care of the planet in the future. The well-being of practising sustainable waste management is that it will free up the space occupied by landfills. The landfills are occupying a massive space and are becoming the destination for waste. Sustainable waste management enhances overall sustainability. The factor responsible for adopting sustainable waste practices is pollution control. Different types of waste have different environmental impacts when inappropriately managed. Proper disposal methods include incinerating medical waste, composting food waste, and recycling materials, which will prevent pollution and its associated consequences. Sustainable management of waste will foster a sense of duty within individuals and communities that producing waste is a natural part of human life, and responsible waste management demonstrates our dedication to minimizing the negative effects of our actions. By adopting new and upgraded technologies for waste management, we can create alternatives to landfills as conscientious residents.

There are four parameters of SD, such as (i) Extreme poverty, (ii) social inclusion (iii) environmental sustainability, and (iv) good governance are the four pillars of sustainable development. Individual and social well-being is possible and practicable through the contribution of the above-mentioned parameters. Health is treated as a human right; therefore, economic development can be achieved only with a healthy and productive population of an economy. Health and other development goals such as agriculture, finance, education, trade and investment, urban

development, transport and communication, law and human rights, etc, are interrelated with each other.

By gathering, classifying, and recycling waste based on its category, waste pickers contribute significantly to waste management. Despite their commitment to environmental sustainability, they encounter inadequate standards for dealing with various types of trash, including hazardous and non-hazardous waste, resulting in infringement of their rights and life-threatening situations. There are some policies enacted by the CG about SWM. such as the SWM Rules of 2016, but these rules failed to acknowledge their rights despite their important contribution to garbage management in the municipalities of Assam. These rules primarily focus on solid waste management; however, the work of waste pickers extends beyond picking solid waste, as they gather other categories of waste. Furthermore, it was observed that most of the waste pickers are illiterate and ill-informed about the health hazards which are associated with their job.

There are international institutions, laws, and organizations that are assessing the global environment and its effect on living species. In general, international environmental laws are essential for improving waste management because they set worldwide standards, promote sustainable practices, and foster international collaboration. Safer waste management techniques are also ensured by agreements like the Stockholm Convention, which seek to phase out dangerous substances. By integrating waste management with broader sustainability objectives found in accords like the Paris Agreement, international environmental laws provide a cohesive approach to safeguarding the environment and human welfare. These assist nations in developing sensible and effective waste management practices.

The international conventions, treaties, laws, and protocols have failed to provide with binding legal obligation, which has led to verbal commitments without strong accountability in the global scenario. The legally binding agreements of the conventions, such as Basel, Rotterdam, and the London Protocol of 1996, have suffered from enforcement gaps. As a consequence, developing countries are exploited due to their weak legal systems. It can be observed from analysing the international environmental convention that the solid waste management domain of the international environmental laws is not specifically addressed. Moreover, several aspects of waste management are not addressed properly.

Because of its temporary and inconsistent approach, the SWM Rules, 2016 have not been able to solve the problem effectively. This rule delegated significant power to the local government. Another disadvantage of this rule is that it fails to acknowledge the rights of waste collectors. These Rules fail to recognise the rights and duties of the waste pickers despite their significant contribution to the waste management of the city. Another important gap found in the SWM Rules 2016 is that it concentrates on operational components and lacks proper procedure and training on how to execute them and how to train the people who are executing these operational components. It had also been observed that the time limit for the enactment of this procedure given by the SWM Rules 2016 is often exhausted. For example, the 2016 Rules require the formation of a state-based advisory board within six months of implementation; however, many states have frequently exceeded this deadline.

Reducing the waste at source is the primary duty to avoid mismanagement of solid waste; however, more focus is given on segregation and disposal. The SWM Rules overlap with one another; not only that, these rules also overlap with the other Rules of the EPA Act 1986. Since these Rules perform a similar kind of function and

responsibility, it often led to confusion and mismanagement. For example, both SWM and the Plastic Waste Management assign duties of collection, segregation, which creates confusion among the local bodies and plastic producers. Similarly, biomedical waste and e-waste are both solid waste and often mixed up with the municipal solid waste, even though they have separate Rules.

This Rule is ineffective in the case of the informal sector. The SWM Rules 2016 discuss integrating waste pickers into the organised sector; however, they don't provide a suitable structure for doing so. Also, Ambiguity can be observed in the implementation of trimline as the timeline is often exhausted without follow-up penalty mechanisms.

The Environmental Protection Act, 1986, has insufficient monitoring and reporting mechanisms, and the penalties provided under the Act are not stringent in their operation. Having a centralized decision-making process involves the approval of the central government for environmental clearance and approval, which often leads to delays in making decisions. Some of the developmental projects of the states require prompt approval; however, due to delays in approval, the projects remain pending for a long period. Even the local laws dealing with waste management in Assam, like the Assam Municipal Corporation Act, 2022, have proved to be insufficient in tackling waste management in Assam.

Empirical data gathered from different Assam municipalities is used to study the management of the state's present solid waste practices. There are 35 districts in Assam. Out of 35 districts, 11 districts were selected for the study. The empirical data are divided into three categories. In the first category, 11 Municipal boards/corporations are interviewed with the help of scheduled questions. From the

Municipal data, the various practices of waste management practices in Assam can be analyzed. The population of Assam was 31205576 in 2011. Under the municipality profile in Assam, Guwahati city recorded the highest population, that is, 957353. It is 3.068 %. Biswanath municipality board recorded the lowest population (18,662). It is 0.060 %. The floating population was the highest in the Guwahati city (3,00,000), whereas the lowest floating population was recorded in the Sivsagar municipality board (1000). The highest municipal wards are recorded in Guwahati city (60), and the lowest municipal wards are recorded in Morigaon (11) town. The Guwahati city has the largest area in square km (162.79 sq.km.), whereas Morigaon has the lowest municipality area (4.1 sq.km.).

There is a satisfactory number of staff in Guwahati, Dibrugarh, Tinsukia, and Haflong in municipal corporations/boards. The number of contractual staff is high in Guwahati, Dibrugarh, Sivasagar, and Goalpara. There is an urgent need to maintain a sufficient number of permanent staff for the smooth functioning of municipal boards/corporations.

The data analysis indicates that the Biswanath municipal region produced the least amount of garbage, while the city of Guwahati produced the most. It was found in a field survey that people in the Biswanath municipal area practice burning waste. In Dibrugarh and Biswanath, there is no provision for dustbins. It is also found in the field survey that the bin-free municipal area refers to an area where door-to-door waste is collected; therefore, there is no need for bins. However, it is observed during the field study that the waste is littered here and there in the street.

Household waste generation depends on the size of the family. It was found in data analysis that 3.1% of the households have no male members in their houses,

69.8% of the households have 1-2 male members, 25.8% of the households have 3 to 4 male members, and 1.3% of the households have 5 to 6 male members in their houses.

Data analysis shows that 48.3% of the total male population learned about solid waste management from newspapers. The same percentage of respondents, 48.3%, gained knowledge from TV. Additionally, 23.4% understood the concept through public meetings, 44.3% received information from educational institutions, 10% learned from NGOs, and 7% understood it through other sources.

Again, it can be analysed that out of the total female respondents 41.4% of them got the knowledge of solid waste management from newspaper, 43.7% of them got the knowledge about solid waste management from television, 12.5% received the idea from public meetings, 48.7% were taught about solid waste management in educational institutions, 7.2% got the idea about it from NGOs and 6.1% got the knowledge from other sources.

Out of the total respondents 81.1% said that plastic bags/ bottles are solid wastes that come out of their households, 68.1 % said that vegetable waste are the solid wastes from their households, 21.1% expressed that glass come out of their households, 44.1 % responded that waste paper cartoons are the solid waste, 21.5% said that electronic waste is the waste from their households, 16.0 % said that filter bags are the solid waste and 1.8% said that other things comes out of their households as solid waste. As per the questionnaire, the respondents opted for more than one item in their answer.

A survey was conducted in eleven districts of Assam to study waste management practices in Assam. 51.6% of the respondents have said that public dustbins are available near their locality, and 40.4% have denied the availability of the public dustbins near their locality. 8% of the respondents did not give a response. Out of the total respondents, 33.6% have said that the solid waste containers are emptied daily in their locality, 19.5% have said that it is done once in two days, 10.7% have said that it is done once in three days, 16.4% have said that it is done weekly, and 10.2% have said that it is done monthly. 9.6% of the respondents did not give any response. Out of the total respondents, 33.6% have said that the solid waste containers are emptied daily in their locality, 19.5% have said that it is done once in two days, 10.7% have said that it is done once in three days, 16.4% have said that it is done weekly, and 10.2% have said that it is done monthly. 9.6% of the respondents did not give any response.

In the traditional approach of waste management, it has been considered as a sequence of steps involving collection, transportation, segregation, distribution, and waste disposal. However, these mechanical features of garbage treatment are frequently given priority in the conventional method, which frequently ignores the negative environmental effects. Respondents were asked questions regarding environmental issues in waste management. 91.1% of participants reported that they had considered that improper solid waste disposal can result in environmental imbalance. It can cause the situation of waterlogging, air pollution, and health hazards. 92% of the respondents stated that improper solid waste management is responsible for health-related issues.

Related to environmental laws, five questions were asked of the respondents during the period of the survey. It was found in data analysis that 48.2 % of respondents said that they are aware of the SWM Rules of 2016, and 51.8 % of the respondents are unaware of the law. Out of the respondents who have completed their studies below HSLC, 40% have said that they are aware of the SWM Rules 2016. Out of the total respondents who have completed their studies from HSLC to Higher Secondary, 46.3% of them have responded that they are aware of the SWM Rules of 2016. Out of the total graduate respondents, 53.6% are aware of the rules, and 42% of the postgraduate respondents are aware of the rules. Out of the total respondents who have completed PG and other higher studies, 50.5% of them are aware of the SWM Rules of 2016. 44.3% of the male respondents agree that we have efficient legislation for environmental matters, and out of the total female respondents, 41.6% of them agree that we have efficient legislation for environmental matters. out of the total respondents 39.1% of them have said that lack of proper enforcement of environment laws is the main issue in our country, 27.1% have said that there are inadequate environmental protection laws, 72% have said that people are not very aware of this, 27.5% of the respondents have expressed that there is a lack of stringent penalties and 8% have said that other issues are present regarding the environmental laws.

A Survey was conducted to examine the socio-economic and legal issues faced by waste pickers. The present researcher surveyed eight municipal areas in Assam - Dibrugarh, Tinsukia, Sivasagar, Nalbari, Haflong, Silchar, Bishwanath, and Guwahati. However, during the field survey, no waste pickers were observed in municipal areas like Haflong and Bishwanth Chariali. The highest age groups of sample waste pickers are recorded in three age groups, such as less than 17, 31-40, and 41-50. The lowest is recorded in the age group of 51-60. The highest number

(52.94%) of children of waste pickers are studying at the primary level. The lowest number (3.92%) of children are studying at the high school level. It was found in data analysis that 11-20 kilos of waste per person/day are collected by 40 percent of the waste pickers. It is also found in the field survey that these waste pickers collect waste without any safety equipment in the dumping sites. The highest amount of waste, 51 kilos and above, is collected by 2.85% of the waste pickers without any safety equipment. The data analysis states that 34.29 percent of the sample waste pickers daily earn less than Rs 200. It is further found that 14.29 percent of the waste pickers earn between Rs 201-250. Only 5.71 % of waste pickers are earning Rs 500 and above. It is found in data analysis that only 5.71 percent of waste pickers get security benefits from the Assam Government.

The Indian judicial system shapes and interprets the country's SMW regulations. The NGT was given the responsibility of resolving environmental issues, which was established in 2010. The natural justice concept guides the actions of this tribunal. It has been determined that the following principles: compensation, polluter pay, precautionary, restoration and rehabilitation, SD, strict and absolute liability, and public trust are the cornerstones for identifying the problems associated with dealing with solid waste. Although relief is provided for environmental disputes however certain implementation failures are observed in certain cases.

The following concepts and recommendations are essential in achieving sustainable waste management:

- Uniform legislation should include all types of solid waste to reduce confusion during implementation.
- A new legislation on SWM is necessary to address the issue, which should be independent of the EPA of 1986.

- An independent waste management tribunal should be established to handle India's garbage disposal challenges. The organizational structure of this tribunal should be separated into two parts: the Central Waste Management Tribunal and the State/UT Waste Management Tribunal.
- There is a requirement for an inspector or supervisor to oversee the waste management implementation in municipalities.
- There should be strong penalties for waste management violators. To deter future violations, the violators should be issued a Challen/Receipt and their identities documented.
- A waste management fund should be established at each of the national and state/UT levels. The fines collected by the state should be deposited in the Waste Management Fund.
- A specific collection location should be established to stop e-waste from being mixed with municipal solid waste. There should be a partnership between the retailers and the dealers, or the brand owners, for the system of take-back. There should also be buy-back or exchange schemes, and most importantly, a toll-free number should be provided for scheduling pick-up for the exhausted e-waste products
- The waste pickers should be brought under the formal sector of the economy, and they should be given social security schemes.
- No person working in the waste management sector will operate without proper skills and training.
- No person shall work in the Waste Management Sector without the safety equipment.

- The animals found in the dumping sites should be rescued with proper treatment. Further, there should be a prohibition on entering animals into the dumping or treatment sites.
- Dumping sites should not be located near water bodies, wetlands, forest areas, roadsides, or human residential areas.
- Municipality Corporation/Boards should have sufficient permanent staff with appropriate salaries to cater to the needs of their family.

Thus, it can be concluded that all the suggestions and recommendations are prerequisites to attain sound and proper waste management practices. There is a necessity to cooperate among various stakeholders like Municipal officials, Pollution Control Board, National Green Tribunal, government and judicial system.

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Annexure I

QUESTIONNAIRE FOR MUNICIPALITY SURVEY

Part I: General Information

1. Name of Municipality:
2. Grade of Municipality:
3. Name of District in which Municipality is located
4. Town Planning Jurisdiction:
5. Population of the Municipality as per the 2011 census/ latest survey
 - a. Male
 - b. Female
6. Number of Slum areas
7. Total Population of the Slum Areas as per the latest census
8. Current area of the Municipality (in square km)
9. Average floating population per day
10. Number of Wards
11. Total number of staff
 - a. Permanent
 - b. temporary
 - c. contractual
 - d. Ad hoc
 - e. Daily wage basis
12. Number of vacant posts
13. Budget Allocation Per annum

Part II: Solid Waste Management Information

1. Waste Generated per day (Metric Tonnes)
2. Collection of Waste per day/week (Metric Tonnes)
3. What are the total number of dustbins in municipality areas?
4. What are the current Number of Dustbin per Ward?
5. What are the number of Dumping sites in the municipality area?
6. What are the practices used for waste disposal?
7. What are the segregation techniques that are followed by the municipality?
8. What types of vehicles used for the purpose of waste disposal
 - a. Tractors
 - b. Mini Trucks
 - c. Trucks
 - d. Dippers
 - e. Push Carts
 - f. Compactors
 - g. Dumper Placer
 - h. Fel/jcb and others
9. What is the average number of trips of the vehicle per day?
10. How many vehicles of the corporation are in good working positions ?

Annexure: II

Questionnaire for House Hold Survey in a Municipality area

Sir/Ma'am, I am a research scholar doing my P.h.D thesis on Solid Waste Management Laws and Sustainable Development: A Study in Assam from Sikkim University. The main objective of this study is to get preliminary information in order to access the importance of solid waste management in the municipalities of Assam to achieve sustainable development. The data collected will be used solely for the Purpose of Ph.D. thesis only.

Yours faithfully

Jahnavi Bhandari

Research Scholar

Department of Law,

Sikkim University

A . General Information

- 1) Name of the respondents:
 - a) Age.....
 - b) Sex.....
 - c) Occupation.....
 - d) Educational qualification.....
 - e) Family Members : Male.....Female.....Total.....
- 2) How long you are residing in the Municipality area?

B. Solid Waste Management

- 1) Do you have any knowledge about the concept of Solid Waste Management?

Yes/No/cannot say

- 2) If yes in through which source

- a. Newspapers
- b. T.V
- c. Public Meetings
- d. Educational institutions

e. NGO's

f. Others

3) Have you ever been educated/trained on proper waste disposal mechanism by the municipal corporation? Yes/ No / Cannot say

4) What type of solid waste comes out from your household?

a. Plastic (bags/bottles etc)

b. vegetable waste

c. Glass

d. Waste paper and cartoons

e. Electronic waste

f. Fiber bags

g. others

5) In what type of container do you collect waste ?

a. plastic bag

b. Waste basket

c. Old bucket

d. Cartoon

e. Tin/can

f. Others.....

C. Sustainable Development

6) Is there any public dustbins near your house or locality: Yes/No

7) How often is the solid waste container emptied from your locality :

a. Daily

b. Once in two days

c. Once in three days

d. Weekly

e. Monthly

8) Where do you usually put away collected solid waste :

- a. In the household bin
- b. In the public bin
- c. Disposed in the roadside
- d. Open space
- e. In a hole in owned compound
- f. Others.....

9) How can you describe the state of public bin near your house in the municipality area

- a. Rusting/ Rotting
- b. Smelly and consumed by animals
- c. Clean and in a good state
- d. Unhygienic and causing health hazards
- e. Others.....

10) Do you think the solid waste disposal mechanism in a problem in your locality Yes/No

D. Environment Impact

11) Do you consider improper solid waste disposal can lead to environmental degradation
yes/ No ?

12) Whom do you consider responsible for this state of affairs:

- a. Citizens b. Municipality c. Government policy d. Enforcement mechanisms

13) Do you ever noticed waste in the road/vacant land/ public areas ? Yes/No

14) Do you ever noticed solid waste in water sources such as Rivers,lakes,wetland areas,
other water bodies yes/No ?

15) Do you ever noticed Burning solid waste in public area or in private establishment?
Yes/No

16) Do you feel that solid waste management is responsible for health related issues? Yes/No

17) Have you noticed the presence of the following in an around public waste bins or dumping sites

- a. Odour
- b. Contaminated waster
- c. Mosquitoes and insects
- d. Domestic animals
- e. Rats
- f. Birds
- g. Scavengers and rag pickers

E. Environmental laws

18) Are you aware of the Solid Waste Management,2016 ? yes/No

19) Do you think we have efficient legislations for Solid Waste Matters? Yes/ No

20) Do you know about Public Interest litigation? Yes/No

21) Did you ever come across someone who is causing pollution to environment? if yes have you reported him?

22) According to you what is the main issues with environmental laws in our country?

- a. Proper enforcement
- b. Inadequate laws
- c. Lack of awareness among people
- d. Lack of stringent penalties
- e. Others

23) Do you consider Community involvement is necessary for managing solid waste? Yes/No

Annexure III

Questionnaire for Rag Pickers

Question No. 1: Name of the Respondent

- a. Age
- b. Male / Female
- c. Educational Qualification
- d. Number of Members in your Family: (a) Male ___ (b) Female ___ (c) Children ___
- e. Marital Status
- f. Religion

Question No. 2: From which place you came?

Question No. 3: Reason for Migration

- a. Flood
- b. Soil erosion
- c. Poverty
- d. Unemployment
- e. Others _____

Question No. 4: In which year / How many years back you have migrated?

Question No. 5: Number of members who are ragpickers in your family:

Question No. 6: Number of school-going children in your family:

- - Male: ___
- - Female: ___

Question No. 7: How many adult members are there in your family?

Question No. 8: Types of Housing

- a. Katcha
- b. Pucca
- c. Rented
- d. Owned

Question No. 9: Do you have electricity in your house? Yes / No

Question No. 10: Do you have water supply in your house? Yes / No

Question No. 11: Where do you go for toilet?

- - Public toilet
- - Private toilet
- - Open space

Question No. 12: How many times during a year do you go back to your home state?

Question No. 13: Who introduced you to rag picking?

- a. Relatives
- b. Friends
- c. Oneself
- d. Others _____

Question No. 14: What type of waste are you collecting?

- a. Polythene bags
- b. Plastic items / Plastic bottles
- c. Empty tins
- d. Aluminum / Glass
- e. Others _____

Question No. 15: How many hours do you go for rag picking in a day?

Question No. 16: Are you involved in other occupations also? Yes / No

Question No. 17: If yes, what is your income?

Question No. 18: Where do you go for rag picking?