

**A STUDY OF THE LEGAL
FRAMEWORK RELATING TO
DISPOSAL OF BIOMEDICAL WASTE IN
INDIA WITH PARTICULAR
REFERENCE TO SILIGURI TOWN**

**A THESIS SUBMITTED TO UNIVERSITY OF NORTH
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DOCTOR OF
PHILOSOPHY IN LAW**

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DECLARATION

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ABSTRACT

Bio-Medical Waste present occupational health risk if it is not properly segregate, package, store, transport, treated and dispose off. Apart from the personnel engaged in the process of management, common people and broadly the environment are also affected due to its ill effect. Improper management of the waste has been a cause of concern due to the rise in the health care institutions throughout the country. Therefore, the necessity arises for the proper management and disposal of it. Such waste is highly dangerous and sources of infection to diseases like Hepatitis B & C and AIDS for which a new thought is the necessity of the hours. The hospital administration as well as the concern pollution control department of the Government is not showing serious concern for the proper management and disposal of the Bio-Medical Waste taking appropriate measures such as providing proper training, education, adequate guidance, adoption of modern technology etc. in the management of the same.

It is the duty of the of the occupier, where required to set-up requisite Bio-Medical Waste treatment facilities for the treatment and dispose off the waste, or ensure requisite treatment of waste at a common waste treatment facility. However, lack of knowledge and awareness among the health care personnel in particular and the public in general the same is creating problem in the way of proper implementation of the Bio-Medical Waste Management Rules, 2016.

With a cooperative and positive attitude the concern department of the Government and the health care institutions including the Government and private hospitals and nursing homes should discharge their respective function properly in order to curb the menace of the Bio-Medical Waste. Much paper work has been done but effective implementation of the same is still at sea. A scientific and universal Bio-Medical Waste strategy is the need of the hour.

PREFACE

The proliferation of the modern globalised era necessitated the establishment of the health care institutions for the treatment of patients for various diseases. Besides the duty to provide health care services, the duty to dispose of the Bio-Medical Waste is *sine quo non* and is the necessary corollary ever since there is a tremendous growth of such institutions. It is ironical that health care institutions on the one hand curing the diseases by providing health care services to the needy, at the same time it is the source of numerous diseases. This is primarily due to the improper handling, segregating and irrational and unscientific treatment and disposal mainly of the waste, which is infectious in nature. Therefore, maintenance of a proper balance between two types of duties is the first and foremost criteria for a healthy, germ free hospital environment and it is possible if the collection, segregation and disposal is made in accordance with the existing Bio-Medical Waste Management Rules, 2016. What is required is a positive attitude towards the proper implementation of the Rules and then only the successful management of the waste would be possible.

It has been seen that country's health care institutions are not properly disposing off the Bio-Medical Waste as per the Rules. An alarming percentage of the waste is improperly disposed off in the open area making it obnoxious to live in as it is spreading pollution (air, water and land) everywhere. An interesting but highly alarming fact is that majority of the hospitals are located within the close proximity of either residential or commercial area making it convenient and easily accessible for the patient and its relatives with a view to avail immediate health care service when emergency arises. The outcome is that it increases the risk factor not only to those living in the vicinity, it also affect the people living in the adjacent areas thereby putting the whole area in danger and is required to be looked into seriously.

Although the Bio-Medical Waste Management Rules, 2016 made it mandatory for all the health care institutions strictly to abide by it but unfortunately the response has been seen very poor. With innovative approaches, emphasising on the need of environmental sustainability and economic viability the management and disposal of the Bio-Medical Waste can be made successful.

The increasing number of the health care institutions in India gives rise to the problem of the management and disposal of the Bio-Medical Waste. Siliguri is not an exception in this regard. Being the gateway of the north-eastern States and situated adjacent to the bordering countries, there has been tremendous growth of the health care institutions in the city which prompted me to undertake the research work with a view to understand the present disposal scenario of Bio-Medical Waste in Siliguri town.

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List of Abbreviations

A.D.-Anno Domini
AD-Auto Disable
AIDS-Acquired Immune Deficiency Syndrome
AMRUT-Atal Mission for Rejuvenation and Urban Transformation
B.C.-Before Christ
BIS-Bureau of Indian Standard
BMW-Bio-Medical Waste
BOD-Biological Oxygen Demand
BSPCB-Bihar State Pollution Control Board
CAG- Comptroller and Auditor General
CBMWTF- Common Bio-Medical Waste Treatment Facility
CDC-Center for Disease Control
CEO-Chief Executive Officer
CHC-Community Health Center
COD-Chemical Oxygen Demand
COSHH-Control of Substances Hazardous to Health
CMOH-Chief Medical Officers of Health
CPCB-Central Pollution Control Board
Cr. P.C.-Criminal Procedure Code
CWA-Clean Water Act
DGSA-Dangerous Goods Safety Adviser
DO-Dissolved Oxygen
DPCC-Delhi Pollution Control Committee
DPSP-Directive Principles of State Policy
EA-Environment Agency
ED-Environment Department
EG-Emission Guidelines
EPA-Environment Protection Agency

EWC-European Waste Catalogue
HBV-Hepatitis B Virus
HCAI-Health-Care Associated Infection
HCU-Health Care Unit
HCV-Hepatitis C Virus
HCW-Health-Care Waste
H&FWD- Health and Family Welfare Department
HIV- Human Immuno Deficiency Virus
HW-Hazardous Waste
IMA-Indian Medical Association
IMEP-Infection Management and Environment Plan
IPC-Indian Penal Code
KAP-Knowledge, Attitude and Practice
KSPCB-Kerala State Pollution Control Board
LCR-Leuco Cyanidin Reductase
MCD-Municipal Corporation of Delhi
MoEF-Ministry of Environment and Forest
MoHFW- Ministry of Health & Family Welfare
MPCB-Maharashtra Pollution Control Board
MPRSA-Marine Protection, Research and Sanctuaries Act
MSW-Municipal Solid Waste
MW-Medical Waste
MWTA-Medical Waste Tracking Act
NACO- National Aids Control Organisation
NACP-National AIDS Control Project
NCT-National Capital Territory
NDMC-New Delhi Municipal Corporation
NEERI-National Environmental Engineering Research Institute
NGO-Non-Governmental Organisation
NGT-National Green Tribunal
NHM- National Health Mission
NHS-National Health Service
NIEA-Northern Ireland Environment Agency

NJP-New Jalpaiguri
NSPS-New Source Performance Standards
NYCRR-New York Codes, Rules and Regulations
OSHA-Occupational Safety and Health Administration
PAC-Public Accounts Committee
PCC- Pollution Control Committee
PEP-Post-Exposure Prophylaxis
pH-power of Hydrogen
PHC-Public Health Center
PIP- Programme Implementation Plan
POP- Persistent Organic Pollutants
PPP-Public-Private Partnership
PUSH-Project for Upgrading Safety in Healthcare
PVC-Poly Vinyl Chloride
RCH-Reproductive and Child Health
RCRA-Resource Conservation Recovery Act
RFID-Radio Frequency Identification
RMW-Regulated Medical Waste
RSO-Radiation Safety Officer
SBS-Sick Building Syndrome
SC-Sub Center
SDH-Siliguri District Hospital
SDM-Sub Divisional Magistrate
SEPA-Scottish Environment Protection Agency
SPCB-State Pollution Control Board
SWDA- Solid Waste Disposal Act
TB-Tuberculosis
TNHSP-Tamil Nadu Health Systems Project
TNPCB-Tamil Nadu Pollution Control Board
TSDF- Treatment Storage and Disposal Facility
UGC-University Grant Commission
UIP- Universal Immunisation Programme
UK-United Kingdom

USA-United States of America

WBPCB-West Bengal Pollution Control Board

WBSHSDP- West Bengal State Health System Development Project

WHO- World Health Organisation

WMC-Waste Management Committee

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Date:

Dipankar Debnath

CHAPTER I

INTRODUCTION

The undaunted pursuit of the human being for survival on the earth from the day it has stride at its journey facing innumerable problems made them bound to unfurl the nature not only for their self protection but also for the establishment of their superiority over the nature consisted of bounty of natural resources. In addition to this, in the greed for socio-economic development, man has started with the unplanned exploitation of the natural resources and in this process it has reached to the extreme level of polluting the environment and the outcome is endangering the very existence of peaceful living of the human being in harmony with the nature and its natural resources. Further, the race of fastest development to achieve the goal of modernisation inevitably made them bound to face new challenges of environmental degradation in the form of global warming, ozone layer depletion, famine, droughts, and floods on the one hand and the pollution of the wholesome environment consisted of air, water, land and the surroundings.

Moreover, the existence of the concept of underdeveloped, developing and developed countries in the present modern era gives rise to the conflicting of interest among the countries in such a manner and increases the competition to such an extent that countries of the world, especially developed countries have reached to extreme level of exploiting the nature forgetting its consequence on them as well as on future generation. Similarly, the growing pressure of population also added to the peril resulting in the deterioration and depletion of the nature at an unprecedented alarming rate.

Therefore, instead of hygienic and healthy environment which the Earth originally had, it turns into an unhealthy, unhygienic and polluted due to the inclusion of different types of wastes; solid, liquid, gaseous and toxic and the sole responsibility conferred on the human beings who with a view to fulfil its own selfish ends created the Earth a place unsuitable to live in. To add to the peril, besides the traditional pollutants that is already present in the environment, the strain of unchecked effluents and emissions from hazardous industries also causes pollution to the environment and its resultant consequent is human health hazards and hazard to the environment as a

whole and hence there is an urgent need to protect the wholesome environment along with the health of the people who are part of such environment.

Health is undoubtedly an inevitable facet of human existence. The age old concept 'health is wealth' is *sine qua non* to the concept of healthy environment. The impact of poor and polluted environment, apart from other issues, affects the health at the most which requires to be cured at its root level. The study shows that the factors responsible for various diseases affecting the health of the human being are attributable to the environment pollutants. This necessarily implies the establishment of health care institutions equipped with all modern facilities to combat health related problems. Diseases such as cold, influenza, headaches, diarrhea etc. with which we are familiar being the type of common diseases and venereal diseases like typhoid, cancer, HIV/AIDS, Hepatitis A and B etc. are to be cured by sending the patient to the health care institutions. With the tremendous growth of population and with the increase in the number of patients the need was felt for the establishment of health care institutions, government as well as private. The natural corollary of the establishment of health care institutions are the generation of large quantity of waste known as the Bio-Medical Waste which if not disposed off properly and effectively would by itself be a reason for environment pollution. It is interesting to note that where on the one hand the patients visits the health care institutions for the treatment of environment borne diseases, on the other, they are subject to pollution borne diseases in the health care institutions for the second time where they have visited for treatment purposes. Such pollution may be due to various reasons. Apart from the human and animal waste, sharp and medicinal wastes are also cause of concern in the recent years which requires proper management and disposal. The invention of medicine and curative processes like surgery etc. produces unwanted waste which by itself is a menace in the environment. As medical science progressed, diseases also increased manifold. Even when it was claimed that one disease was eradicated, a new and incurable disease emerged as a side or direct effect of the treatment. Being a complex multidisciplinary system, the whole infrastructure of a health care institution should be eco-friendly and infection free and should be equipped with all modern technology to combat the unhealthy and unhygienic unavoidable aspect relating to the Bio-Medical Waste.

With the increase in the volume of services rendered in healthcare sector there has been consequent increase in the volumes of such waste, which is the subject of this study. Study revealed that a large section of the healthcare sector has not given importance to the proper management and handling of Bio-Medical Wastes including its disposal. Not only are the health care personnel are at risk of acquiring infection through improper handling hospital wastes, but also general public is exposed to avoidable risks. The risk to the public increases many folds when it is improperly disposed off as the same is thrown in the open area without considering its ill effect in the environment which resulting in various of infectious diseases such as AIDS, Hepatitis A and B among others. Till 1996 it remained as a neglected area. It was in the year 1996 the Hon'ble Supreme Court for the first time in *B.L. Wadhwa v. Union of India*¹ while dealing with the Municipal solid waste highlighted on the management of new menace originated from the health care institution i.e. Bio-Medical Waste. The decision led to the passing of the law relating to the subject in the year 1998 the name being the Bio-Medical Waste (Management and Handling) Rules, 1998 which was subject to amendments for twice to overcome the lacunae. Recently, owing to the insufficiency in the old Rule it was replaced by the Bio-Medical Waste Management Rules, 2016. The present research work has undertaken the task of analysing various aspect relating to the Bio-Medical Waste including the existing disposal scenario prevailing in the country with special emphasise in Siliguri town and the same has been highlighted under different chapters.

I. Evolution of the problem

The apparent risks of un-disposed Bio-Medical Waste not only causes occupational health hazards to doctors, nurses and other staffs, patients and their attendants but also is a major cause for environmental hazards and therefore, the consequences of such wastes is not confined within the sphere of health care institutions alone but spills over to beyond the health care institutions.

According to the report of World Health Organisation (WHO) the bio-medical waste generated today is many times more than what was generated three decades ago. But the concern for minimising the same has not yet been thought of with gravity

¹ AIR 1996 SC 2969.

despite the existence of various laws as to decrease the risk of spreading diseases arises from such waste. Certain percentage of the waste generated from health care institutions are highly infectious and hazardous in nature that may cause serious ailments, Hepatitis B, Hepatitis C, HIV/AIDS etc. are few among other virulent diseases. World-wide as per the WHO 8-16 millions hepatitis B, 2.3 to 4.7 million hepatitis C and 80000 to 160000 HIV infections are estimated to occur from the re-use of syringe needle without sterilization.²

Medical care is vital for our life, health and well being. But the waste generated from medical activities can be hazardous, toxic and even lethal because of their high potential for diseases transmission. The hazardous and toxic part of waste from health care establishments comprising infectious, bio-medical and radio-active material as well as sharps (hypodermic needles, knives, scalpel etc.) constitute a grave risk, if these are not properly treated/disposed or is allowed to get mixed with other municipal waste.

The necessity of managing health care waste in a scientific manner has been receiving increasing attention in India over the past few years due to the serious threat to public health, pollution of air, water and land resources arising out of its improper management. Its propensity to mix up with various non-hazardous and non-toxic substances necessitated its management and disposal in accordance with the Bio-Medical Management Rules, 2016.

With a judicious planning and management, however, the risk can be considerably reduced. Studies have shown that about three fourth of the total waste generated in health care establishments is non-hazardous and non-toxic. Some estimates put the infectious waste at 15% and other hazardous waste at 5%.³ The reports and figures available from developed countries indicate that approximately 1-5 kg of waste is generated per bed per day. In India, it is estimated to be 2.0 kg/bed/day.⁴

²Ravi Agarwal, "Halls of healing, dens of decay- Intervention," *The Times of India*, 2000.

³ Dr. Lily Srivastava, *Law and Medicine* pg. 21(Universal Law Publishing Co, New Delhi, 1st Edn., 2010).

⁴ Central Pollution Control Board, "Manual on Hospital Waste Management," (March 2000).

II. Statement of the problem

Despite the existence of Bio-Medical Waste Rules and the existence of the policies and guidelines framed by the Central Pollution Control Board and the State Pollution Control Board for the proper handling, management and disposal of it, the government as well as private health care institutions in the country including Siliguri town are unsuccessful in taking appropriate steps for the management of the Bio-Medical Waste. The indiscriminate disposal of the waste is a serious cause of concern because it is posing a constant threat both to the health of the living being and in the environment as well. According to the present position only one privately owned disposal van is available in this city for the transportation of the biomedical waste. In the government health care centre's no attempt has been initiated by the authority for segregating the biomedical waste into solid, infectious and hazardous waste.

Siliguri, being considered as the transit point of different countries and states, many patient and their relatives visits the place every day for medical and other reason. Thus, in terms of its geographical importance it is the duty of every health care personnel to take initiatives for the proper management and the disposal of the Bio-Medical Waste. Therefore, scientific health care waste management should be a part of routine hospital management. An effective scientific management programme would help in reducing the menace arising out of such waste.

Although with the financial aid from World Bank, a health Care Waste Management Programme has been introduced in West Bengal for eco-friendly disposal of infections and hazardous waste and one Technical Advisory Committee involving the municipalities of Bengal was set up to manage the programme and the municipalities were advised to develop scientific health care waste management system for the State. Unfortunately, no such steps have been adopted by the authority to that effect. It shows that there is lack of awareness regarding the harmful effect of Bio-Medical Waste.

III. Hypothesis

Bio-medical waste in India is a serious health and environment hazard. Study revealed that despite the existence of the Bio-Medical Waste Management Rules,

2016, most of the health care institutions have failed to dispose it off in a safe and environmentally sound manner and thereby posing a constant threat to the environment and the health of the living being. As the management and disposal of the Bio-Medical Waste requires diligence and care from a chain of people, starting with the staff, continuing through collection workers, and finishing with disposal operators. If any of these lack knowledge or carelessness in their work, or disposed indiscriminately or allow scavengers or children access to the waste the chain would be broken and dangers of infection would follow. Therefore, there is an urgent need to have an insight in the existing laws and the practices prevailing in the health care institutions in the country.

IV. Research Questions

The present research involves various questions:

1. Whether the health care institutions are disposing of the waste in accordance with the existing Bio-Medical Waste Management Rules, 2016?
2. What are the reasons for not following such Rules properly?
3. Whether there are gaps in the Rules itself?
4. How the developed countries are managing the Bio-Medical Waste?
5. What measures could be adopted to minimise the risk of spreading of diseases?
6. How could the knowledge and awareness among the health care personnel be improve?
7. Are the disposal methods provided by the Bio-Medical Waste Management Rules, 2016 followed by the health care institution?
8. Whether the proper disposal methods are being followed for the particular type/category of the Bio-Medical Waste?

V. Objective of the study

Prior to the Bio-Medical Waste (Management & Handling) Rules, 1998 the waste was considered as ordinary waste and the same was treated and disposed off with the municipal wastes most of which are solid in nature. But its multidimensional consequences is not confined within the health care institutions affecting the health of patients, hospital staffs only and extended beyond its boundaries to the general public

causing even death. Even after the framing of the Rules it has been the tendency of the health care institutions to dispose it off with the municipal wastes so as to avoid the cost of disposal. In this background, it is important to examine the existing problem of improper management of the Bio-Medical Waste with a view to eradicate the root cause and to ensure proper management of the same. With this objective in view the researcher has undertook to study the whole aspect of the Bio-Medical Waste in Siliguri town in the light of the situation prevailing in the country within the ambit of the existing Rules and to propose curative measures.

VI. Contribution of the study

The increasing number of hospitals which speaks for it the deteriorating environmental conditions not only because of inadequate facilities compared to the need but also mishandling of the wastes generated from this quarters are posing serious health hazards. Considering the seriousness and harmful effect of Bio-Medical Waste on environment an attempt has been made under this research work to analyse the Bio-Medical Waste Management Rules, 2016 and to find out the lacunas with suggestive measures to fill up the gap. Further, a comparative study shall be made of developed countries to identify and to adopt the measures for the management, handling and disposal of the biomedical waste which will contribute to the control and regulate the Bio-Medical Waste disposal. Further, an empirical study shall also be made to have an idea regarding the present Bio-Medical Waste disposal practices prevailing in Siliguri town.

VII. Significance of the study

The research work is not only attempted to raise awareness amongst the health care personnel about the ill effect of Bio-Medical Waste but focuses on how the improper application of the Bio-Medical Waste Management Rules, 2016 are creating health hazards to all living beings and polluting environment in the surrounding area. It is also significant to find out the way for the strict enforcement of the same because failure to adhere to the Rules will jeopardize the purpose for which it is framed.

VIII. Scope and limitation of the study

The Bio-Medical Waste issue has been a crucial issue in the recent years due to its propensity to contaminate with water, air and land affecting both the health and the environment. Therefore, in accordance with the existing Bio-Medical Waste Management Rules, 2016, such waste is to be collected, segregated and to be disposed off. Each stage in the management of the waste is important and decisive in the sense that the whole management processes being a part of the chain has to be carefully and successfully implemented. The breaking up of any part of the chain would affect the whole chain as a result of which proper disposal of the waste would fail. Therefore, the study on the issue relating to the Bio-Medical Waste management and its disposal is nothing but the study of the whole chain starting from the collection, segregation to its successful disposal. The scope of the study confined to the study of the whole chain in order to have a clear understanding on the disposal part. The scope of the study is limited only to a few health care institutions which are also subject to other limitations such as willingness to co-operate, lack of spontaneity, availability of the proper information etc. It was also subject to financial constraint and for which the researcher had only confined to the particular category of the Bio-Medical Waste and the general waste i.e. the solid waste has been kept out of the purview of this research study.

IX. Chapterisation

The present research work has been divided into ten chapters including introduction and conclusion along with suggestive recommendations. A brief summary of the chapters has been referred below.

CHAPTER I: INTRODUCTION

The introductory chapter highlighted a brief overview of the topic entitled “**A Study of the Legal Framework Relating to Disposal of Bio-Medical Waste in India with Particular Reference to Siliguri Town**” along with the detail synopsis of the research work.

CHAPTER II: THE CONCEPT OF BIO-MEDICAL WASTE, A NEW MENACE ON THE ENVIRONMENT: AN OVERVIEW

The chapter shall consist of detail analysis of various Bio-Medical Waste related issues such as its meaning, category, the procedure of segregation, treatment, transportation and disposal. The chapter has been segregated into sub-heads which include the definition of the very term Bio-Medical Waste, its classifications/categorisation, sources, impact on the health and environment etc. A detail overview of the classification would help in having a thorough knowledge about the various types of such waste because it is not all kinds of waste which involve risk factor to the health of human beings as well as the environment. It is mainly the infectious waste found in the Bio-Medical Waste that involves risk factor to those persons handling the same. Only this category of Bio-Medical Waste has far reaching impact on the health of the human beings causing many dreadful disease including Hepatitis A, B and C, AIDS etc. which deserve special mention. Taking into consideration its harmful effect, the chapter also refers the various processes required to be followed for proper management of the Bio-Medical Waste. This includes, along with the waste collection and segregation, the identification of proper colour bags where the particular categories of Bio-Medical Waste is to be primarily stored. The importance of storage of the waste for the time being till it is collected and disposed of by the responsible authority has also been discussed in the chapter. The chapter shall be focused on the importance of following the widely accepted three 'R's' i.e. Recovery, Reuse and Recycling in order to reduce the cost of handling the Bio-Medical Waste. After collection and segregation into different bags the waste is required to be disposed of in accordance with the Rule and to know it in detail the chapter shall also highlight with the methods of disposal of specific category of Bio-Medical Waste as per the law.

CHAPTER III: THE QUEST FOR THE BIO-MEDICAL WASTE MANAGEMENT UNDER THE INTERNATIONAL ENVIRONMENTAL REGIME: AN OVERVIEW

Under this chapter attempt shall be made to analyse various International environmental Conference and Conventions held from time to time that has

highlighted on the importance for the protection and preservation of wholesome environment nationally as well as internationally and the steps to be adopted to fight against the new menaces including the Bio-Medical Waste. Apart from the Stockholm Conference held in 1972, the chapter focuses on those conventions and conferences in which the Bio-Medical Waste has been specifically dealt with. An analysis of the provisions of various international conventions is necessary in understanding the various facet of international pollution problem including the problem due to the Bio-Medical Waste. The adoption of appropriate measures to cope up with the problem of this waste in tune of the International Conferences and Conventions by the world community would help in curving the menace. The chapter is divided into pre-Stockholm, Stockholm and the post-Stockholm so that it would be helpful to have a detail idea regarding various International Conventions which will provide with the knowledge relating to international environmental issues. Among all the conventions, three important conventions *viz.* the Basel Convention 1989, and its subsequent amendments, the Stockholm Convention on Persistent Organic Pollutants, 2010 and the Minamata Convention on Mercury, 2013 shall also be specifically discussed because these Conventions consisted of the provisions relating to the management of the subject Bio-Medical Waste.

CHAPTER IV: THE QUEST FOR BIO-MEDICAL WASTE UNDER THE INDIA'S ENVIRONMENTAL REGIME SINCE ANCIENT PERIOD

India's environment regime can be traced back from the various religious text be it of Hindus, Christians, Muslims etc. because the environment issues has always been a matter of concern from the time immemorial having connection with the nature. It has been universally accepted that nature is the creation of the God. If we look back to the past ancient history it is evident that during that period nature was worshipped as the earth was considered as the Mother and this way the environment was protected. The trend is still prevalent in India. The search in the past environment history might have help in focusing on the scenario pertaining to the Bio-Medical Waste management during that period. The chapter takes into account different texts such as the Vedas, the Puranas, the Upanishads etc. that might have highlighted on the importance of the protection and preservation of the nature and the consequence for its destruction. An analysis of certain texts such as Manusmriti, Arthashastra shall

also be made to find out the answer as to the management of the Bio-Medical Waste during the period when it was written. Right from the ancient period through medieval and British period, the chapter made a brief overview on the quest for the Bio-Medical Waste management in India. The transformation of the concept of environment protection by the human being as the creation of God under the religious texts and consequent passing of the laws during the colonial legal regime for its protection is as important and welcome change that shall also be looked into under this chapter.

CHAPTER V: CONSTITUTIONAL DOMAIN FOR THE MANAGEMENT OF BIO -MEDICAL WASTE

Any discussion on the aspect of Bio-Medical Waste management in India without highlighting on the Constitutional framework because it is the Constitution of every country which provided with the principal framework within the province of which the matter is to be dealt with. In search of the specific provisions relating to the Bio-Medical Waste, the chapter shall be make an analysis on the various provisions of the Constitution of India relating to the environment within the framework of which the management of Bio-Medical could be made. The analysis of such provisions is incomplete without having a detailed idea regarding the Preamble to the Constitution. Chapters dealing with the Fundamental Rights, Fundamental Duties, Directive Principles of State Policy and the chapter on Centre-State relations shall be discussed in the light of the judicial pronouncement to trace out the issues concerning the management of Bio-Medical Waste. It should be noted here that originally there was no specific provisions under the Indian Constitution that specifically dealt with the environment issues. It was the Constitution Forty-Second (Amendment) Act, 1976 which inserted Article 48-A and 51-A(g) for the protection and promotion of the environment and is form part of Directive Principles of State Policy and the Fundamental Duty respectively. The chapter also focuses on the active role of the judiciary showing serious concern on the environment degradation and its consequent impact on the nature including the focus on Bio-Medical Waste. The judicial activism played by the Hon'ble Supreme Court and various High Courts of the country attracting the attention on the new menaces for environment degradation and the issue

of directions in connection with the same has been considered as an important step towards the protection of the wholesome environment. In fact, it was due to the Apex Court's concern the Bio-Medical Waste had come in the limelight for the first time and steps was taken accordingly.

CHAPTER VI: MANAGEMENT OF BIO-MEDICAL WASTE UNDER THE GENERAL AND PARTICULAR ENVIRONMENTAL LEGISLATION IN INDIA

This Chapter shall undertake to analyse not only of those general laws enacted during pre-independence period it also discusses elaborately some of the specific laws, rules, regulations etc. to deal effectively with the Bio-Medical Waste issues. The general laws such as Indian Penal Code, Code of Criminal Procedure, The Factories Act, The Air Act, The Water Act and the Environment Protection Act shall be analysed for obtaining an elaborate knowledge to find out the answer of the question whether management of Bio-Medical Waste could be possible under these laws or a separate law is the need of the hour. Further, some specific Rules such as The Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, The Municipal Solid Waste Rules, The Batteries Management and Handling Rules, The Hazardous Waste Management and Handling Transboundary Movement Rules shall also be examined having connection with it along with the general laws excluding the Bio-Medical Waste Management Rules, 2016. The Bio-Medical Waste Management Rules, 2016 being the main law shall be extensively examined under a separate chapter to find out whether the existing Rules is sufficient or it has to amend further so as to include provisions on the basis of which the problem can be effectively handle. The present Chapter has been divided into two parts namely; the control and management of bio-medical waste during pre-independence period under the general laws and the post-independence general and specific laws relating to the handling and management Bio-Medical Waste.

CHAPTER VII: CURRENT SCENARIO OF THE BIO-MEDICAL WASTE DISPOSAL IN INDIA UNDER THE EXISTING LEGAL FRAMEWORK: A CRITICAL ANALYSIS OF BIO-MEDICAL WASTE MANAGEMENT RULES, 2016

The chapter is an attempt to understand the existing scenario of Bio-Medical Waste disposal in India under the existing legal framework i.e the Bio-Medical Waste Management Rules, 2016. Despite having specific laws on the subject it is to be seen that how far the country is successful in combating the new menace of the environment. Different States such as Karnataka, Maharashtra, Uttar Pradesh, Kerala, West Bengal, Bihar and Tamil Nadu has been chosen to understand the overall existing scenario of the whole country. An overview of the present position under the existing legal framework is important to find out whether the existing Rule is self-sufficient or it suffers from loopholes which shall be removed for properly managing the Bio-Medical Waste. Therefore, a critical analysis shall be made of the old Rules to have the detail idea about the management of Bio-Medical Waste in the light of the new Rules. The chapter shall also make a critical analysis of the present Rule in order to find out the lacunae, if any. In addition to this, it shall undertake the analysis of various Guidelines, Manuals, National long-term policy, National Health Mission etc. dealing mainly with the Bio-Medical Waste matters. The long-term Five-Year Plan shall be discussed under this chapter to know the initiatives undertaken by the Government of India to combat with the problem.

CHAPTER VIII: BIO-MEDICAL WASTE DISPOSAL SCENARIO IN USA, UK AND CHINA UNDER THE RESPECTIVE LEGAL FRAMEWORK

As the generation of Bio-Medical Waste is inevitable and care is to be taken to manage the same effectively in accordance with the Indian existing law, the question arises as to whether the law is comprehensive or due to the various loopholes in the law itself the proper management of the same could not be possible, hence this chapter is an attempt to analyse the laws in force in other countries relating to the subject, especially in the developed countries so that the researcher would be in a position to make a comparative analysis between the laws of those countries with Indian law and if there exist any anonymity it could come up with the suggestive

measures by adaptation of which the management of Bio-Medical Waste could properly be made. Therefore, the existing laws of USA, U.K. and China has been taken up with a view to make a brief analysis of these laws to find out the answer whether Indian laws on the subject is comprehensive or a need still existed to amend the same. Apart from the prevailing laws of those countries, the chapter has also undertaken various policy guidelines of those countries to have a clear and broader understanding on the subject. Further, the researcher has chosen one city from each country to get an empirical view of the existing scenario prevailing there under the existing laws of those countries. This would help the researcher to find out the answer of the question whether the existing laws of those countries are comprehensive or it also suffers from drawbacks. It is also pertaining to know that if the laws are satisfactory then what remedial measures to be adopted to manage the Bio-Medical Waste problem within the ambit of such laws.

CHAPTER IX: STATUS OF THE BIO-MEDICAL WASTE DISPOSAL SCENARIO IN SILIGURI TOWN: AN EMPIRICAL STUDY

The chapter focuses on the survey conducted by the researcher in and around Siliguri Town to know the legal implications of Bio-medical Waste Management Rules 2016. Siliguri being a growing city and situated in the border area of different countries such as Nepal, Bhutan and Bangladesh, many people from these countries used to visit here with a view to receive health care services and the outcome is the tremendous growth of health care institutions in this area. The consequent result is the generation of large quantity of the Bio-Medical Waste which is required to be managed properly. With this aim in view an empirical study shall be made of this area in order to highlight on the existing practical scenario prevailing in the town.

CHAPTER X: CONCLUSION AND RECOMMENDATIONS

X. Methodology

Owing to its serious ill effect in and around Siliguri Town and other bordering countries, it is proposed that during the course of research work both doctrinal as well as empirical study shall be done to find out the gaps and also to provide suggestive measures to fill up the gap. To achieve such goal an analysis of different book, Acts, Rules, Policy Guidelines, Manuals, Article written by

eminent scholars shall be made. To know how the Bio-Medical Waste is collected, segregation, sterilise and dispose, an empirical study shall also be made by the research to throw light on the actual practical implication collecting data from different health care personnel connected with the Bio-Medical Waste.

For the empirical research the following methodology is applied:

(a) Universe of Study

The universe of the study for the sake of convenience has been divided into Geographical, Institutional and Individual units. Geographical unit covers whole Siliguri Town. All hospitals, nursing homes, pathology etc. are the subject of study under institutional unit and individual units includes alongwith the health care personnel the people living in Siliguri Town.

(b) Framing of sample and sampling procedure

All those persons who are associated with the handling, segregation, management and disposal programme of the Bio-Medical Waste. They are among others administrative officers, doctors, nurses, sweepers and laboratory technicians. Taking into consideration the nature of the units as heterogeneous and the universe is limited to Siliguri town the sampling procedure to be adopted in this research work is simple random procedure.

(c) Tools and techniques for the collection of data

In order to complete the empirical research the tools and techniques adopted by the researcher is the questionnaire and interview method. A set of total of thirty questions each to various health care personnel such as doctors, nurses, sweepers etc. shall be given to the health care personnel who are the subject of the study. The data shall also be collected through observation and interview methods. As it is not possible for the researcher to interview each and every person involve in handling, segregation, disposal of biomedical waste, primary data shall be collected through simple random sampling selecting minimum of one health care personnel falling in a particular categories from amongst doctors, nurses, auxiliary staffs etc.

(d) Data Processing

The responses collected from different health care personnel by way of questionnaire and interview shall be scrutinised and edited in order to eliminate probable irregularities. After editing, the entire material shall be classified, coded and tabulated according to the need. The tabulation so prepared shall be analysed and the percentage of such responses will be calculated to project the actual figure. The literature of the research shall be prepared accordingly along with the suggestions for the inclusion of the new concept.

XI. Literature Review

There have been significant works in the past few years at the international level and initiatives have been taken at different fronts on issues relating to the pollution of environment resulting from bio-medical waste. Until 1972 UN Conference on the Human Environment held at Stockholm, the subject for the conservation of environment had been dealt with in a fragmentary manner. Some of the pre-Stockholm environment related conferences are The Nuclear Weapons Tests Ban Treaty 1963, Treaty of the Principles Governing the Activities of the States on the Exploration and the use of outer Space, 1967, The convention on Wetlands etc. These conferences threw light upon the environmental degradation worldwide and the duties of each participant country to protect environment from pollution. Review of the decisions taken in different conference held in international level will be made to show the concern for the protection of environment.

During the post 1972 era there are some major international instruments such as Nairobi Declaration 1982, The Basel Convention 1988 United Nations Conference on Environment and Development or Earth Summit, 1992, adoption of Earth Charter or Rio Declaration 1992, etc. which were held in different years and which seeks to indicate different problems facing the world relating to pollution of environment had discussed. Review of all the instruments will help to focus on the research of bio-medical waste. Further, mention must be made particularly the steps initiated by the World Health Organisation (WHO) on health care wastes and its safe management by organizing different conferences which started since 1999 at Geneva.

At the national level, there are number of environment related legislation ensuring protection of the environment by its proper implementation. Important

among them are Environment (Protection) Act, 1986, Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act, 1981. Indian Penal Code 1860, Criminal Procedure Code 1973, Indian Easement Act 1882 are some Acts that incorporates provisions relating to environment. Besides, there are specific Acts relating to waste management in India for the purpose of management and handling of general wastes such as, Waste Management Act 1996, Waste Management (Movements of Hazardous Waste) Regulations 1998, Waste Management (Collection Permit) (Amendment) Regulations 2008, Transport Regulations, which deserve special mention. The Bio-Medical (handling and Management) of Wastes Rules 1998, is a weapon that can be use against those who does not follow the rules or improperly follow the procedures for the handling of bio-medical waste and is applicable throughout India.

Besides, the Constitution of India that enumerates provisions relating to environment under Art 21 which are considered as basic and inalienable right and includes within its purview the right to health as a fundamental right. Hence review of different Articles is the obvious corollary while doing research work on bio-medical waste.

Apart from the different international instruments, national laws relating to the biomedical waste of health care institute it is also important to review books and literatures to find out the lacunae and to frame out solution which must be the task of every research scholar dealing with particular topic.

Sushma Sahai, *Bio-Medical Waste Management* APH Publishing Corporation, (2009) is a book which reviews critically various social, economic and regulatory policies which address environmental issues. It stresses on the interdisciplinary and inter-related nature of environments, irrational handling of biomedical waste, its impact on disease epidemiology, recycling and commercialization of biomedical waste. Since there has been a paradigm shift from curative to preventive medicine, the foundation has already been laid to encourage research on such themes, like hospital waste management. Critical issues, like lack of awareness of the Rules and risks involved during handling hospital waste and unwanted recycling of contagious waste products need to be addressed in order to develop a full proof biomedical waste management system. Instead of providing an end-of-pipe solution a Cradle-to-Grave approach would entail a comprehensive

analysis of the management of Biomedical Waste. This would be a formal approach to define and evaluate the total environmental load (physical and social) associated with the generation and disposal of Biomedical Waste from the word start to finish.

J. Kishore, and G.K. Ingle, *Biomedical Waste Management in India*, Century Publications, New Delhi, (2004)- The book is a compilation of Government notification and guidelines issue on the subject. The material is updated and well organised in different chapters. The authors have taken care to include the legal issues and legislations pertaining to biomedical waste management in a simple and systematised manner. The issues related to the technology of biomedical waste management have been described at length. One section is entirely devoted to the alternative technologies for biomedical waste.

SRISHTI, *Managing Hospital Waste- A Guide for Health Care Facilities*, (revised ed., 2000) –This is a very useful handbook of SRISHTI, who are the pioneering NGO in bio-medical waste management in India, for managing waste in health care institution. A very useful guide for establishing a system of waste management in a particular Health Care Unit. Management problems typical to primary level health care waste and immunisation programme on waste have not been addressed.

SRISHTI, *Hospital Waste – Time to Act*, June, (2002)- The publication contains a collection of factsheets on very important topics related to biomedical waste management. The topics covered are sharps disposal, economy of hospital waste management, plastics in healthcare, incineration, mercury handling training, safety of healthcare worker, treatment technologies etc. This publication is relevant to address a number of problems encountered in primary health care and immunization waste management like management of waste sharps, plastics, precautionary measures and training.

Central Pollution Control Board, “Guidelines for Common Bio-Medical Waste Treatment Facility & Incineration,” (New Delhi, 2006)-The CPCB laid down these guidelines to meet regulatory need thrown up by new situations involving establishment of Common Treatment Facilities, its location, infrastructure, collection and transportation, disposal of treated BMW. For incinerator guidelines have been provided regarding general applicability and installation, design, air pollution control device, operator of incinerator etc.

Government of India, “Infection Management & Environment Plan (IMEP) for Reproductive & Child Health Programme,” Ministry of Health & Family Welfare, Phase-II, (2004). The main focus of the Infection Management and Environment Plan (IMEP) is to underpin the operations of RCH-II to deliver better health outcomes for the common people while ensuring the safety of the healthcare service providers. The plan provides among other things: General instructions for managing BMW, anatomical waste to be buried by ANMs at generation points and in the pits at PHCs.

Government of West Bengal, “Action Plan on Health Care Waste Management,” WBHSDP, Department of Health & Family Welfare, December (2003)- This action plan is the outcome of the rigorous exercise undertaken to manage health care waste in the secondary level govt. health care units under the West Bengal Health System Development Project. This detailed action plan covers areas like legal aspects and responsibilities, institutional arrangements for implementation along with formation of facility level task forces, basic aspects of HCWM like categorization and composition of health care waste by quality and quantity etc.

Prof. R. C. Gupta, “Toxic Medicinal Plantation and Hospital Waste Management,” CURE, Vol. VI, Environmental Bulletin (2000)- is an article on the different categories of medical wastes identified by WHO. Some of which is infectious others hazardous in nature. Such categories help in identifying and segregating the waste and the system of treatment to be followed while dealing with biomedical waste has been focused. It helps in following the processes to be adopted while disposing the same in a enviro-friendly manner.

C. M. Jariwala, “The Bio-Medical Waste: Direction of Law and Justice,” Vol. 41, J.I.L.I., (1999), critically examines and evaluates the broad directions of the biomedical waste law and justice administered and also suggested for the reforms of the rules and improve the control mechanism so that the biomedical waste does not take the shape of an environmental hazard in India.

Deepa Basu, *The Handling of Disposal of Medical Wastes, Law & Medicines, Vol. 3, (1997)-* drew attention on the burning of biomedical waste through incinerator which produces a dangerous by products of toxic chlorinated compounds called dioxins and furans which are carcinogenic and known to suppress immune

system and cause fetal and reproductive damage and thus considered as an important source of air pollution. These articles also suggested measures to be taken for the proper incinerations of the biomedical waste.

Central Pollution Control Board, “Manual on Hospital Waste Management,” (March 2000)- highlighted on the drawbacks for the improper use of incinerator. While operating the incinerators it has to keep in mind that excessive stack emission, smoke leakage from the charging door or other openings, excessive auxiliary fuel usage and incomplete burnout of the waste must be within control. This should be checked through proper operation of the incinerator together with an effective preventive maintenance programme.

Soma Basu, “Medical Waste Disposal, Burning Problem”, *The Hindu*- Survey on the Environment, 1998 refers to treatment processes to be adopted by the health care units within each State and also made a comparative view as to which method is best suited for the disposal of biomedical waste.

V. Hegde, et. al., *Biomedical waste management, J Oral Maxillofac Pathol, (2007)*-This review article discusses about the various types of waste, its management and the hazards of indiscriminate disposal of hospital waste and in brief about dental waste management. Proper handling, treatment and disposal of biomedical wastes are important elements of health care office infection control programme. Correct procedure will help protect health care workers, patients and the local community. If properly designed and applied, waste management can be a relatively effective and an efficient compliance-related practice.

Mohd Faisal Khan, *Hospital Waste Management: Principles and Guidelines, Kanishka, (2007)*- Biomedical waste poses a wide variety of health and safety hazards for patients and health care workers. Safe and effective management of biomedical waste generated by health care institutions is not only a legal necessity but also a social responsibility. In this book an attempt has been made to generate awareness regarding sources of biomedical waste, their classification and the hazards posed by hospital waste. The book intends to provide a comprehensive framework for the safe and effective management of hospital waste and will be of immense value for the health

care institutions and health care worker doctors, Nurses, Paramedical staff and Hospital administrators who are at constant risk due to hazards posed by improper management of hospital waste.

S. Saini, “Knowledge, Attitude and Practices of Bio-Medical Waste Management Amongst Staff of a Tertiary Level hospital in India,” Journal of the Academy of Hospital Administration, Vol. 17, No.2, 2005- This article on Knowledge, Attitude and Practice (KAP) on the subject is carried out in a tertiary level teaching hospital to observe significant gap in the knowledge, attitude and practice of the consultants, residents and scientists with regard to biomedical waste disposal, to their knowledge/understanding on the subject.

R. C. Anand and R.C. Satpathy Sidhartha, “Hospital Waste Management- A Holistic Approach,” Vol. 12 Journal of the Academy of Hospital Administration, (2000)-This book fulfils a long felt need of hospital administrators, nursing administrators, hospital engineers, sanitation supervisors, laboratory personnel and students of Hospital and Health Administration. The authors have more than three decades of experience in the field of hospital administration. However, it is felt that some of the areas which is required to be incorporated in the subsequent editions include the management of waste in the semi-urban and rural areas where modern technology is not readily available. More flow charts, diagrams would be required in the initial chapters to give a better visual impact to the readers.

Chandra Hem and Shishoo Sunil, “Sharps” (Biomedical Waste) management- A model for Implementation (An Experimental Study),” Vol. 13 Journal of the Academy of Hospital Administration, (2001)-This article highlighted on the infectious diseases spread through the improper use of the sharps, as they transmit infection directly into the body by puncture. Disinfection at the source of generation is the best treatment for sharps. Moreover, the process and the chemical which are useful for disinfecting the sharps have been discussed in details in the article. This will help in raising the awareness amongst the health care personnel deals with sharps.

Mukesh Yadav, “Hospital Waste-A Major Problem,” Vol. 8 Hospital Today JK- Practitioner, (October-December 2001)-This article focused on the historical perspective of the hospital waste and its concern internationally throughout the world specially USA. The seriousness of improper Bio-Medical Waste management was brought to the limelight during the “beach wash-ups” during summer 1998; which was investigated by the Environment Protection Agency (EPA) of USA and it culminated in the passing of Medical Waste Tracking Act (MWTA) 1988 and made USA the pioneer as far as waste management is concerned.

CHAPTER II

THE CONCEPT OF BIO-MEDICAL WASTE, A NEW MENACE ON THE ENVIRONMENT: AN OVERVIEW

In order to cater to the needs of the expanding population and to achieve the goal of “Health for All” by 2000 A.D. adopted at the Alma Ata Conference in 1978, the last century witnessed rapid mushrooming of healthcare institutions in both government and in private sectors. Due to a combination of lack of know-how and enforcement, the wastes¹ generated in such establishments are being treated indiscriminately; consequently the same have been posing a constant threat to the environment. The entire operation and maintenance seems like a lost battle. In today’s ‘throw-away-society’, it is a veritable hell-a city littered with garbage and filth².

There is no denying the fact that a modern hospital is a complex, multidisciplinary system which consumes thousands of items for delivery of medical care and is a part of physical environment. All these products consumed in the hospital leave some unusable leftovers i.e. Bio-Medical Waste³. The problem of Bio-Medical Waste has gained enormous proportions and complex dimensions in recent years. The emergence and acceptance of disposable hospital waste generation is an important factor in the current scenario. Being part of social organisation that aimed at meeting the medico-social needs of the community, hospital environments have undergone tremendous changes. In this process where, on the one hand, hospitals are providing for the best opportunities in the health care, on the other, it is affecting the health of the community as a whole including doctors, staffs, etc. due to the unscientific management and disposal of the Bio-Medical Waste spread through water, sweat, blood, body fluids and contaminated organs. Therefore, proper management of hospital waste is essential to maintain hygiene, aesthetics, cleanliness and control of environmental pollution. The hospital waste like body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster

¹ Known as bio-medical waste in India and health care waste or clinical waste or medical waste in many other countries.

² Dr. Sushma Sahai, *Bio-Medical Waste Management* pg. 1 (A.P.H. Publishing Corporation, 1st Edn., 2009).

³ Mohd Faisal Khan, *Hospital Waste Management: Principles and Guidelines* pg. 1 (Kanishka Publishers, 1st Edn., 2004).

casts from infected and contaminated areas are very essential to be properly collected, segregated, stored, transported, treated and disposed of in safe manner to prevent nosocomial or hospital acquired infection.

The inadequate, inappropriate and improper waste management not only leads to foul odour creating air pollution, it also causes water and land pollution, due to the propensity of mixing the such waste with air, water and land through disease carrying organisms like insects, rodents and worm etc. In addition to it the improper use of the infectious waste such as used sharps, needles etc. also causes accidental injuries. Owing to unsafe healthcare practices, half a million people all over the world die every year due to infections like hepatitis B, and C, HIV and hepato-cellular carcinoma⁴. The World Health Organisation⁵ (WHO) has estimated that, in 2000, injections with contaminated syringes caused;

- 21 million hepatitis B virus (HBV) infections (32% of all new infections),
- Two million hepatitis C virus (HCV) infections (40% of all new infections),
- 260 000 HIV infections (5% of all new infections).

Epidemiological studies indicate that a person who experiences one needle-stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively to become infected with HBV, HCV and HIV. In 2002, the results of a WHO assessment conducted in 22 developing countries showed that the proportion of health-care facilities that do not use proper waste disposal methods ranges from 18% to 64%. According to WHO, category wise percentage of waste generation, non infectious waste is 80% , pathological and infectious waste 15% , sharps waste 1 % , chemical or pharmaceutical waste 3 % and others 1 %⁶. Thus, it can be said that between 75% and 90% of the waste produced by health-care providers is comparable to domestic waste and usually called “non-hazardous” or

⁴ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg.1 (Jaypee Brothers Medical Publishers (p) Ltd.1st Edn., 2012).

⁵ Mohd Inayatulla Khan, M. C. Prasant, *et.al.*, “Bio Medical Waste Management- An Emerging Problem” 1 Global Journal of Medicine and Public Health pg. 51 (Jan-Feb 2012).

⁶ Andhra Pradesh Environment Protection Training & Research Institute, *Bio-Medical Waste Management Self Learning Document For Nurses & Paramedical*, World Health Organization (WHO), (India Country Office, New Delhi), Available at: http://www.indiannursingcouncil.org/pdf/Bio-medical_waste_management_self_learning_document_for_Nurses_and_Paramedica.pdf (Last visited on Sept. 12, 2016).

“general health-care waste”. It comes mostly from the administrative, kitchen and housekeeping functions at health-care facilities and may also include packaging waste and waste generated during maintenance of health-care buildings. The remaining 10–25% of health-care waste is regarded as “hazardous” and may pose a variety of environmental and health risks.⁷ Developed countries generate approximately 1 to 5 kg of hospital waste/bed/day, whereas developing countries 1-2 kg/bed/day. In developed countries like US and Canada, annual waste production in over 1 million hospital beds is about 2 tones per hospital bed, or about 2,000,000 tones in total.⁸ The Table (Table 1) given below shows the quantity of waste produced by different countries every day.

Table 1

Quantity of BMW generated in different countries⁹

Country	Quantity of waste generated (kg/bed/day)
UK	2.5
USA	4.5
France	2.5
Spain	3.0
India	1.5

2.1 Meaning of Bio-medical Waste

The term biomedical waste means any solid or liquid waste that may pose the risk of infection to humans, including non-liquid tissue, body parts, blood, blood products, and body fluids of human beings including laboratory and veterinary wastes containing human pathogens and discarded sharps. It also includes blood absorbent and non absorbent substances, blood products, body fluids, secretions, secretions contaminated with blood and blood saturated or blood products. In other words, bio-medical waste includes all the waste generated within health-care facilities, research

⁷ Yves Chartier, Jorge Emmanuel, *et. al.*, “Safe management of wastes from health-care activities” pg. 3 (WHO Press, World Health Organisation, 2nd Edn., 2014).

⁸ Mohd Faisal Khan, *Hospital Waste Management: Principles and Guidelines* pg. 2 (Kanishka Publishers, 1st Edn., 2004).

⁹ S Manasi , K S Umamani *et. al.*, “Bio-medical Waste Management: Issue and Concerns-A Ward Level Study of Bangalore City,” pg. 3 The Institute of Social and Economic Change, (2014).

centres and laboratories related to medical procedures. In addition, it includes the same types of waste originating from minor and scattered sources, including waste produced in the course of health care undertaken in the home (e.g. home dialysis, self-administration of insulin, recuperative care).

According to D. A. Baldwin, Bio-Medical waste can be defined as “infectious waste, which is hazardous, as it is contaminated with disease causing pathogens. The human and animal wastes along with items saturated or dripping with, blood and body fluids, discarded medical equipments, soiled cotton, plasters and dressing, surgical and autopsy wastes, can all become a major health hazard, as they provide fertile environs for bacteria, virus and other micro-organisms to multiply.”¹⁰

As per WHO, bio-medical waste “includes all the waste generated by health-care establishments, research facilities and laboratories. In addition, it includes the waste originating from “minor” or “scattered” sources-such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.).”¹¹

In this context it is pertinent to mention the definition of bio-medical waste under the Indian Bio-Medical Waste Management Rules, 2016. Rule 3 (f) says, “bio-medical waste” means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to these rules¹².

In United Kingdom bio-medical waste which is termed as clinical waste is defined in regulation 1(2) of The Controlled Waste Regulations 1992 (SI1992/588) of United Kingdom as follows:

1. any waste which consists wholly or partly of human or animal tissue, blood, other body fluids, excretion, drugs or other pharmaceutical products, swabs or

¹⁰ Dr. Sushma Sahai, *Bio-Medical Waste Management* pg. 67 (A.P.H. Publishing Corporation, 1st Edn., 2009).

¹¹ *Ibid.*

¹² Government of India, Notification, Ministry of Environment, Forest and Climate Change, New Delhi, (March 28, 2016).

dressings, or syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous to any person coming into contact with it, and

2. any other waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar practice, investigation treatment, care, teaching or research, or the collection of blood for transfusion, being waste which may cause infection to any person coming into contact with it¹³.

2.2 Classification of Bio-Medical Waste

An extremely important aspect of managing the bio-medical waste is its classification. The classification is essential in order to adopt and follow the entire management process so that risk factor could possibly be avoided. It depends on type of waste and how it has to be treated and disposed of. As discussed above that majority of bio-medical wastes are non-hazardous and only a small amount of such wastes are hazardous. Although in small quantity of varying types, such hazardous wastes are regarded as most dangerous and harmful. Let us discuss various hazardous bio-medical wastes which are required to be identified for its proper management.

2.2.1 Hazardous Waste

Hazardous waste is an unwanted material and a specific class of refuse in the form of solid, liquid or gaseous if emitted to the nature can cause potential danger to living beings and the environment. It is explosive, flammable, oxidising, poisonous, radioactive, corrosive or toxic. The following are the different types of hazardous wastes:

2.2.1.1 Infectious Waste

Infectious waste is material suspected to contain pathogens (bacteria, viruses, parasites or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts¹⁴. This category includes:

¹³ R. Chandrappa and D. B. Das, "Solid Waste Management" Environmental Science and Engineering pg. 148 (Springer-Verlag Berlin Heidelberg 2012).

¹⁴ Dr. Sushma Sahai, *Bio-Medical Waste Management* pg. 69 (A.P.H. Publishing Corporation, 1st Edn., 2009).

a. Waste contaminated with blood or other body fluids

This includes free-flowing blood, blood components and other body fluids; dressings, bandages, swabs, gloves, masks, gowns, drapes and other material contaminated with blood or other body fluids; and waste that has been in contact with the blood of patients undergoing haemodialysis (e.g. dialysis equipment such as tubing and filters, disposable towels, gowns, aprons, gloves and laboratory coats).

b. Cultures and stocks of infectious agents from laboratory work

Laboratory cultures and stocks are highly infectious waste. Waste from autopsies, animal bodies, and other waste items that have been inoculated, infected, or in contact with highly infectious agents are highly infectious waste. Discarded instruments or materials that have been in contact with persons or animals infected with highly infectious agents are also to be considered infectious waste.

c. Waste from infected patients in isolation wards

Such waste includes excreta, dressings from infected or surgical wounds, and clothes heavily soiled with human blood or other body fluids. Waste from non-infective patients and that is not contaminated with blood or body fluids may be considered non-infectious.

2.2.1.2 Sharp Waste

Sharps are items that could cause cuts or puncture wounds, including needles, hypodermic needles, scalpels and other blades, knives, infusion sets, saws, broken glass and nails. Whether or not they are infected, such items are usually considered highly hazardous health-care waste and should be treated as if they were potentially infected¹⁵.

2.2.1.3 Pathological Waste

Pathological waste could be considered a subcategory of infectious waste, but is often classified separately – especially when special methods of handling, treatment

¹⁵ *Ibid* at pg. 72.

and disposal are used. Pathological waste consists of tissues, organs, body parts, blood, body fluids and other waste from surgery and autopsies on patients with infectious diseases. It also includes human fetuses and infected animal carcasses. Recognisable human or animal body parts are sometimes called anatomical waste. Pathological waste may include healthy body parts that have been removed during a medical procedure or produced during medical research¹⁶.

2.2.1.4 Pharmaceutical waste, including Genotoxic Waste

Pharmaceutical waste includes expired, unused, spilt and contaminated pharmaceutical products, prescribed and proprietary drugs, vaccines and sera that are no longer required. The category also includes discarded items heavily contaminated during the handling of pharmaceuticals, such as bottles, vials and boxes containing pharmaceutical residues, gloves, masks and connecting tubing.

Genotoxic waste is highly hazardous and may have mutagenic (capable of inducing a genetic mutation), teratogenic (capable of causing defects in an embryo or fetus) or carcinogenic (cancer-causing) properties. Genotoxic waste may include certain cytostatic drugs, vomit, urine or faeces from patients treated with cytostatic drugs, chemicals and radioactive material¹⁷.

2.2.1.5 Chemical waste

Chemical waste consists of discarded solid, liquid and gaseous chemicals, i.e. those generated from diagnostic and experimental work and from cleaning, housekeeping and disinfecting procedures. Chemical waste from health care is considered to be hazardous if it has at least one of the following properties.

- Toxic (harmful)
- Corrosive (e.g. acids of pH 12)
- Flammable
- Reactive (explosive, water reactive, shock sensitive)

¹⁶ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg. 5 (Jaypee Brothers Medical Publishers (p) Ltd. 1st Edn., 2012).

¹⁷ *Ibid* at pg. 6.

- Oxidizing¹⁸.

Non-hazardous chemical waste consists of chemicals with none of the above properties; for example, sugars, amino acids and certain organic and inorganic salts, which are widely used in transfusion liquids¹⁹.

2.2.1.6 Radioactive Waste

Radioactive wastes are materials contaminated with radionuclides. They may take solid, liquid and gaseous all three forms. They are produced as a result of procedures such as in vitro analysis of body tissue and fluid, in vivo organ imaging and tumour localisation, and various investigative and therapeutic practices²⁰. The waste produced by health-care and research activities involving radionuclides and related equipment maintenance and storage can be classified as sealed sources, spent radionuclide generators, low-level solid waste (e.g. absorbent paper, swabs, glassware, syringes, vials), residues from shipments of radioactive material and unwanted solutions of radionuclides intended for diagnostic or therapeutic use etc²¹.

2.2.2 Non-hazardous General Waste

Non-hazardous or general waste is waste that has not been in contact with infectious agents, hazardous chemicals or radioactive substances and does not pose a sharps hazard. A significant proportion (about 85%) of all waste from health-care facilities is non-hazardous waste and is usually similar in characteristics to municipal solid waste. More than half of all non-hazardous waste from hospitals is paper, cardboard and plastics, while the rest comprises discarded food, metal, glass, textiles, plastics, wood etc²².

¹⁸ Dr. Sushma Sahai, *Bio-Medical Waste Management* pg. 72 (A.P.H. Publishing Corporation, 1st Edn., 2009).

¹⁹ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg.8 (Jaypee Brothers Medical Publishers (p) Ltd.1st Edn., 2012).

²⁰ Dr. Sushma Sahai, *Bio-Medical Waste Management* pg. 76 (A.P.H. Publishing Corporation, 1st Edn., 2009).

²¹ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg. 8 (Jaypee Brothers Medical Publishers (p) Ltd.1st Edn., 2012).

²² Yves Chartier, Jorge Emmanuel, *et. al.*, "Safe management of wastes from health-care activities" pg. 8 (WHO Press, World Health Organisation, 2nd Edn., 2014).

2.3 Sources of Bio-Medical Wastes

Knowing the types and quantity of waste produced in a health care institution is an important step and it is pertinent to identify different sources which produce such waste. It may be noted here that the health care institutions are not the only producer of bio-medical waste; there are other institutions of significant concern (referred below under the minor sources) that also generate waste. Detail knowledge with regard to the types and quantity would help the authority preparing the appropriate data on the basis of which estimate of required containers, storage areas, transportation and treatment technologies can be made. Waste-generation data can be used to establish baseline data on rates of production in different medical areas and for procurement specifications, planning, budgeting, calculating revenues from recycling, optimisation of waste-management systems and environmental impact assessments. Therefore, an important step towards the management of this waste is to identify its sources and for the same it can be categorised as major or minor sources according to the quantities produced. While minor and scattered sources may produce some health-care waste in categories similar to hospital waste, their composition will be different. The sources of bio-medical waste are as follows:

2.3.1 Major Sources

- Government hospitals/private hospitals/nursing homes/dispensaries.
- Primary health Centers.
- Medical Colleges and research centers/paramedic services.
- Veterinary colleges and animal research centers.
- Blood banks/mortuaries/autopsy centers.
- Biotechnology institutions.
- Production units.

Apart from the above sources, there are blood banks, autopsy centers etc. which also produces particular types of wastes. There are various wards in the health care centers that give rise to different types of wastes. For example, infectious waste such as dressings, bandages, used hypodermic needles, intravenous sets, gloves, disposable medical items, sticking plaster, body fluids

and excreta are generated in every medical wards. Anatomical waste, such as tissues, organs, body parts including fetuses can be found in operation theaters and surgical wards. Besides, there are immunisation wards which produce hypodermic needles and syringes, residual vaccine, cotton swabs and ampoules, etc. In laboratories, mainly pathological and highly infectious waste e.g. small pieces of tissue, infected animal carcasses, micro-biological cultures, stocks of infectious agents, blood and other body fluids plus sharps, some radioactive and chemical waste are generated. The list also included research centers, production units etc. which also generate huge quantity of bio-medical waste consisting of animal tissues, organs, body parts, carcasses, body fluids, blood of experimental animals. Microbiological and bio-technological wastes are also generated in these institutions.

2.3.2 Minor Sources

- Physicians/ dentists' clinics
- Animal houses/slaughter houses.
- Blood donation camps.
- Vaccination centers.
- Acupuncturists/psychiatric clinics/cosmetic piercing.
- Funeral services.
- Institutions for disabled persons.

Nowadays there are large numbers of clinics that are in existence to deal with particular species of health problem. In addition to this the invention of new medical treatment technology and the raising concern in health awareness demanded the setting up of many vaccination centers, blood donation camps and in turn they also produces different types of bio-medical waste. The generation of bio-medical waste from such sources varies in composition and quantities. The above mentioned minor sources typically have some common features:

- They rarely produce radioactive or cytostatic waste.
- Human body parts are not normally produced.

- The quantity of chemical waste is very low.
- Sharps consist mainly of hypodermic needles²³.

Majority of bio-medical waste generated from such minor sources are infectious and sharps wastes. Although the quantity of waste is low but due to its infectious nature the risk factor involved in it cannot be avoided.

2.4 Health Impact from Hazardous Bio-Medical Waste

It is now clear that bio-medical waste includes a large component of general waste and a smaller proportion of hazardous waste. Although less in number, such waste is the cause of concern not only from the environmental point of view in general, it also has an ill effect to the health of people involved in it such as doctors, nurses, hospital maintenance personnel, patients, visitors, workers including those workers involve in waste disposal. The exposure of such wastes is the result of various diseases as referred in Table 2.

Table 2²⁴

Different disease relating to Bio-medical waste

Organism	Disease Caused	Related Waste Items
VIRUSES HIV, Hepatitis B, Hepatitis A,C, Arboviruses, Enteroviruses.	AIDS, infectious Hepatitis, Dengue, Japanese encephalitis, tick-borne fevers, etc., dysentery.	Infected needles, body fluids, human excreta, soiled linen, blood.
Bacteria Shigella spp., salmonella typhi, vibrio cholera, clostridium tetani, staphylococcus spp., pseudomonas, streptococcus, borrelia spp.	Shigellosis, typhoid, cholera, tetanus, wound infections, septicemia, rheumatic fever, endocarditis, skin and soft tissue infections, louse and tick borne fevers.	Human excreta and body fluid in landfills and hospital wards, sharps such as needles, surgical blades in hospital waste, rodent infestations of poorly managed landfills and dumping grounds.
Parasites such as giardia	Giardiasis, cutaneous	Human excreta, blood and

²³ Yves Chartier, Jorge Emmanuel, *et. al.*, "Safe management of wastes from health-care activities" pg.10 (WHO Press, World Health Organisation, 2nd Edn., 2014).

²⁴ Dr. Saurabh Sikka, "Bio-Medical Waste in Indian Context" Available at: http://www.academia.edu/4913465/BIOMEDICAL_WASTE_IN_INDIAN_CONTEXT (Last visited on Sept. 22, 2016).

lamblia, wucheraria bancrofti, plasmodium.	leishmaniasis, kala azar, malaria.	body fluids in poorly managed sewage system of hospitals.
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Many of the hazards associated with biomedical wastes are hidden. Injuries are not an immediate effect from such hazards but they can accumulate or remain latent in the body for years resulted into hepatitis B, C and cancer. Therefore, all unknown substances are suspected to be considered hazardous. There are several reasons which make some of the bio-medical waste hazardous and they are the existence of infectious agents, genotoxic, contained hazardous chemicals, sharps, radioactive etc.

Let us discuss in detail the potential hazards due to the exposure of bio-medical waste on the environment and also on the people who are directly or indirectly connected with such waste and are prone to various dangerous diseases.

2.4.1 Hazards to the Environment

Poor handling of biomedical waste causes serious environmental problems in terms of air, water and land pollution. Nature of pollutants that can be classified into biological, chemical and radioactive contributed to air, water and land pollution. Air pollution can be cause in both indoors and outdoors. Indoor air pollutants like pathogens present in the waste can enter and remain in the air in the health care centers for a long period in the form of spores or as pathogens itself. This can result in hospital acquired infections (nosocomial) spread through various viruses causing diseases like AIDS, Hepatitis B & C etc. or occupational health hazards. These viruses are generally transmitted through injuries from sharps contaminated with human blood. If such wastes are disposed of in the open places without proper treatment, alongwith the general public the environment also gets polluted. Dust may harbor tubercle bacilli and other germs, which cause diseases if inhaled. However, indoor air pollution can also be caused due to poor ventilation, use of chemicals for disinfections, fumigants etc. resulted in acidic reaction and produces hazardous gases.

The outdoor pollution can also be cause by pathogens. When waste without pre treatment is being transported outside the health care centre, or if it is dumped

openly, pathogens can enter into the atmosphere. The most important are biological agents, which pollute water and food and causes alimentary infections like cholera, typhoid, dysentery, infective hepatitis, polio, ascariasis and hook worm diseases etc²⁵.

Most of the chemicals and pharmaceuticals used in health-care establishments are hazardous e.g. toxic, genotoxic, corrosive, flammable, reactive, explosive, shock-sensitive. Their intoxication can occur either by acute or by chronic exposure. Exposure to genotoxic substances in healthcare occurs during the preparation of particular drug/chemicals, treatment with particular drugs or chemicals and handling and disposal²⁶. Chemical pollutants that cause outdoor air pollution have two major sources-open burning and incinerators. Open burning of such waste is most harmful and dangerous. The presence of plastics and hazardous materials in the waste will generate harmful gases such as oxides of sulphur, oxides of nitrogen, carbon dioxide and suspended particulate matter. These when inhaled can cause respiratory diseases. Certain organic gases such as dioxins and furan are carcinogenic in nature.

Radioactive emissions and radioactive wastes through research and radio-immunisation activities may produce small quantities of radioactive gas. The type and extent of exposure determines the type of disease caused by radioactive waste that range from minor symptoms to more serious problems. Gaseous radioactive material should be evacuated directly to the outside by a special exhaust system or an activated carbon trapping device may be used. In its liquid form radioactive waste can come from chemical or biological research, from body organ imaging, from decontamination of radioactive spills, from patient urine and from scintillation liquids used in radioimmunoassay. Undoubtedly, this last source of liquid waste produces the largest volume of liquid radioactive waste. Indiscriminate disposal of radioactive waste in general waste stream may create some serious and life-threatening situation. One such accidental exposure to high activity radioactive waste in New Delhi in April 2010 left five persons critically ill²⁷.

²⁵ *Ibid.*

²⁶ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg.29 (Jaypee Brothers Medical Publishers (p) Ltd.1st Edn., 2012)..

²⁷ A. Tandon, "Cobalt-60 imported as industrial Waste?" *The Tribune*, April 12, 2010.

Water pollution is another major threat from bio-medical waste. If the waste is dumped in low-lying areas, or into lakes and water bodies, can cause severe water pollution. Besides the presence of biologicals, chemicals or radioactive substances in water cannot be ignored. The pathogens present in the waste can leach out and contaminate the ground water or surface water. Harmful chemicals present in such waste also cause water pollution. Poor land filling technology may cause water pollution in the form of leachates. Water pollution can alter parameters like pH, BOD, DO, COD, etc. There are instances where dioxins are reported from water bodies near incinerator plants. Dioxins enter the water body from the air²⁸.

Land pollution is caused by the final disposal of all bio-medical waste. Even liquid effluent after treatment is spread on land. Hence, pollution caused to land is inevitable. Open dumping of the waste is greatest cause for land pollution. Land filling is also harmful to a limited extent. Soil pollution from such waste is caused due to infectious waste. Discarded medicines, chemicals used in treatment and ash and other waste generated during treatment processes. Heavy metals such as cadmium, lead, mercury etc., which are present in the waste get absorbed by plants and can then enter the food chain. Nitrates and phosphates present in leachates from landfills are also pollutants. Leachate containing concentrated heavy metals and or microbes which released from landfills can lead to ground and surface water pollution²⁹.

Radioactive waste generated can cause soil pollution. Cadavers, protective clothing, absorbent paper generated in the nuclear medicine imaging laboratory also cause soil pollution. Last but not the least breed vermin and pests from bio-medical waste also cause pollution. Mosquitoes that transmit insect borne diseases like malaria and filarial, common houseflies which transmit infections mechanically are some examples in this regard. Soil may be rich in tetanus spores or the blood borne pathogens have gained significant attention after the attack of HIV and HBV, HCV which can lead to AIDS and Hepatitis B, C and other viral and bacterial infections³⁰.

²⁸ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg. 31 (Jaypee Brothers Medical Publishers (p) Ltd. 1st Edn., 2012).

²⁹ *Ibid.*

³⁰ *Ibid* at pg. 8.

2.4.2 Hazards to Persons

All individuals coming into close proximity with hazardous bio-medical waste are potentially at risk from exposure to a hazard specially the patients. Their attendants also have a chance of contracting infections causes due to pathogens or spores which are air borne. The list is not small; it also includes those attached to the health-care facilities who produce hazardous waste, and those who either handle such waste or are exposed to it as a consequence of careless actions. Besides, as already mentioned above the other groups consisted are doctors, nurses, health-care auxiliaries and hospital maintenance personnel etc. Let us see how people are getting affected from different types of bio-medical wastes that give rise to different diseases.

2.4.2.1 From Infectious Waste

Regarding infectious waste, three infections are most commonly transmitted: Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immune Deficiency Virus (HIV). Among the 35 million health care workers worldwide, the estimations show that each year about 3 million receive hard exposures to blood-borne pathogens, 2 million of those to HBV, 0.9 million to HCV, and 170,000 to HIV. Also, the workers involved in the collection and treatment of the biomedical waste are exposed to a certain risk³¹. Apart from the diseases referred above the Table 3 below provides an extensive information relating to other diseases also that might be caused by exposure to bio-medical waste are listed in Table 3³².

Table 3

Potential infections caused by exposure to bio-medical wastes, causative organisms and transmission vehicles

Infection Type	Pathogen Agents	Transmission Path
Gastrointestinal infections	Enterobacteria: Salmon ell, Shigella spp., Vibrio Cholerae, Helminths	Faeces or/and vomiting liquid
Respiratory infections	Mycobacterium	Respiratory secretions,

³¹ Nikos E. Mastorakis, Carmen A. Bulucea, *et. al.*, “Environmental and health risks associated with biomedical waste management” pg. 287 Development, Energy, Environment, Economics (2010).

³² Yves Chartier, Jorge Emmanuel, *et. al.*, “Safe management of wastes from health-care activities” pg. 27 (WHO Press, World Health Organisation, 2nd Edn., 2014).

	tuberculosis Measles virus Streptococcus pneumoniae	saliva
Eye infections	Herpes virus	Eye secretions
Genital infections	Neisseria gonorrhoeae Herpes virus	Genital secretions
Skin infections	Streptococcus spp.	Purulent secretions
Anthrax	Bacillus anthracis	Secretions of skin lesions
Meningitis	Neisseria meningitides	LCR
AIDS	HIV	Blood, semen, vaginal secretions
Haemorrhagic fevers	Junin Viruses, Lassa, Ebola Marburg	Biological fluids and secretions
Septicemia	Staphylococcus ssp	Blood
Viral Hepatitis type A	VHA	Faeces
Viral Hepatitis type B and C	VHB, VHC	Blood, biological fluids

The infectious waste is likely to be contained in a variety of pathogenic microorganisms. The microorganisms from pathogens enter into the human body through a puncture, abrasion or cut in the skin, by inhalation, through mucous membranes etc.

2.4.2.2 From Chemical and Pharmaceutical Waste

The risk involved in the chemical and pharmaceutical wastes are due to the following factors: toxic, genotoxic, corrosive, flammable, explosive, teratogenic, mutagenic and this can be infused into the body through drug administered intravenous, breakage of containers, partially used vials, expired medicines etc.

Larger amounts of such biomedical waste occur when unwanted or expired chemical and pharmaceutical products are removed. These can cause poisoning by absorption through the skin or mucous membranes, by inhalation or by ingestion. Chemicals and pharmaceuticals may also determine lesions of skin, eye, and respiratory mucosa. The most common injuries are the burns. Chemical waste removed by drainage system may have toxic effects on ecosystems and water where are discharged. Similar effects may have the pharmaceuticals which contain antibiotics or other drugs, heavy metals, disinfectants and antiseptics³³.

³³ Nikos E. Mastorakis, Carmen A. Bulucea, *et. al.*, "Environmental and health risks associated with biomedical waste management" pg. 288 Development, Energy, Environment, Economics (2010).

2.4.2.3 From Genotoxic and Cytotoxic Waste

Exposure to genotoxic substances in health care may occur during the preparation of, or treatment with, particular drugs or chemicals. The main pathways of exposure are inhalation of dust or aerosols, absorption through the skin, ingestion of food accidentally contaminated with cytotoxic drugs, ingestion as a result of bad practice, such as mouth pipetting, or from waste items. Exposure may also occur through contact with body fluids and secretions of patients undergoing chemotherapy³⁴. Cytotoxic drugs such as alkylating agents, intercalating agents etc. are extreme irritants and have harmful local effects after direct contact with skin or eyes. Cytotoxic drugs may also cause dizziness, nausea, headache or dermatitis.

2.4.2.4 From Radioactive Waste

The nature of illness caused by radioactive waste is determined by the type and extent of exposure. It can range from headache, dizziness and vomiting to much more serious problems. Radioactive waste is genotoxic, and a sufficiently high radiation dose may also affect genetic material. Handling highly active sources, such as those used in diagnostic instruments (e.g. gallium sealed sources) may cause much more severe injuries, including tissue destruction, necessitating the amputation of body parts. Extreme cases can be fatal. The hazards of low-activity radioactive waste may arise from contamination of external surfaces of containers or improper mode or duration of waste storage. Health-care workers, and waste-handling and cleaning personnel exposed to radioactivity are most at risk³⁵.

2.5 Need for the Regulatory Measures for the Effective Management of Bio-Medical Waste

In the light of the above perspective, it is important to have effective bio-medical waste management system which in turn would help in the reduction of the same and thereby the risk factors involved in it could be avoided. For this purpose the need is to have effective regulatory measures which include framing of policies, proper guidelines and laws. Along with the effective policy framework and technical

³⁴ Yves Chartier, Jorge Emmanuel, *et. al.*, "Safe management of wastes from health-care activities" pg.29 (WHO Press, World Health Organisation, 2nd Edn., 2014).

³⁵ *Ibid* at pg. 30.

guidelines, national legislation is considered as the most important basis for improving bio-medical waste practices in any country. The national policy should take into account the resources and facilities available in the country concerned and any cultural aspects of waste handling. It establishes legal controls and permits the national agency responsible for the disposal of such waste. This will help in the treatment of different waste categories by following specific step like segregation, collection, storage, handling, disposal and transport of waste and responsibilities and training requirements. It is noteworthy that while preparing the guiding principle five principles which have been widely recognised as underlying the effective and controlled management of wastes should be borne in mind. These principles have been used by many countries when developing their policies, legislation and guidance. They are³⁶:

- **Polluter pays principle**- implies that all producers of waste are legally and financially responsible for the safe and environmentally sound disposal of the waste they produce.
- **Precautionary principle**- is a persuasive principle governing health and safety protection.
- **Duty of care principle**- stipulates that any person handling or managing hazardous substances or wastes or related equipment is ethically responsible for using the utmost care in that task.
- **Proximity principle**- recommends that treatment and disposal of hazardous waste take place at the closest possible location to its source to minimise the risks involved in its transport and
- **Prior informed consent principle**- It requires that affected communities and other stakeholders be apprised of the hazards and risks, and that their consent be obtained.

³⁶ *Ibid* at pg. 42.

It is to be mentioned here that the Central Government of India in exercise of the powers conferred by Sections 6, 8 and 25 of the Environment Protection Act, 1986, in 1998 has notified a specific Rule on the subject namely, the Bio-medical Waste (Management and Handling) Rules, 1998 which have been amended thrice in the year 2000, 2003 and 2011 and recently a new rule has been notified viz. the Bio-medical Waste Management Rules, 2016. The Rule 1998 along with its amendments and the new Rule have been discussed in the subsequent chapter in detail.

The need for a comprehensive specific law on the subject lies in the fact that it will not only help in the proper management of the Bio-Medical Waste efficiently, it also reduces the chance of the risk involved in it gradually. To attain the goal of minimising the risk factor such law would also consist of provisions based on recovery, reuse and recycling policy and also provisions in connection with the segregation, labeling and disposal of the remaining waste in a scientific way by adopting advance technology for the same. Further, there must be established an authority under the law whose task would be to look into whether such laws are being effectively implemented or not. The inclusion of the provisions in connection with the waste reduction would help in the proper management of the same. Therefore, it is important to have a detail idea as discussed below:

2.5.1 Source Reduction: Recovery, Reuse and Recycling³⁷

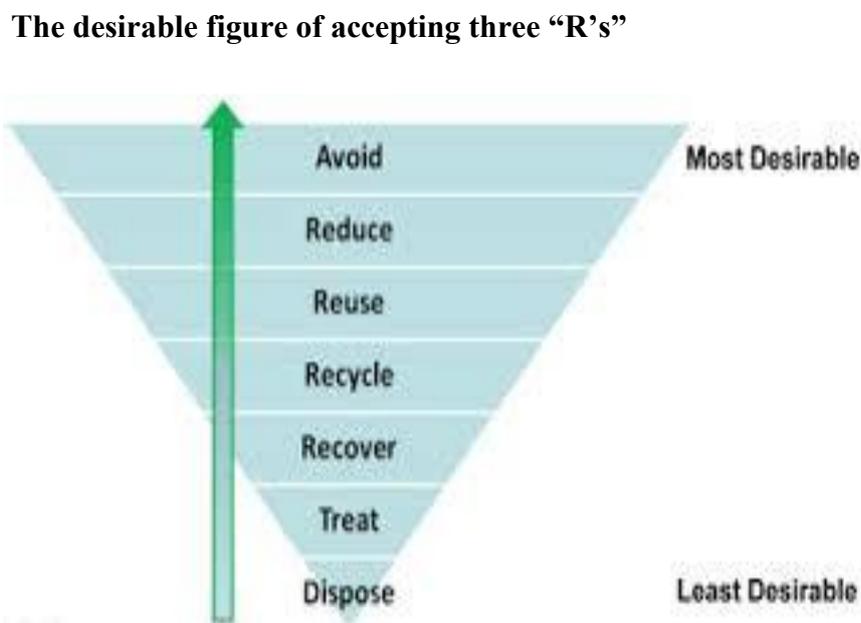
In order to minimise the risk the law should consists of provisions relating to three “R’s” i.e. reduce, reuse and recycle (See Figure1) as far as possible which is consider as an important measure in the process of reducing such waste which has some advantages behind it. This is the most important steps towards reduction of bio-medical waste from sources. A comprehensive waste reduction principle from the source must be adopted in every health care institution to reduce the waste to minimum. This would help in managing the waste properly and effectively. This can be possible through product substitution, technology change and good operating practices. An effective step for the reduction of the waste at source is to focus on the potential replacement of medical and surgical supplies with reusable supplies.

³⁷ *Ibid.*

Reusable items may include certain sharps, such as scalpels and hypodermic needles, syringes, glass bottles and containers, etc. Along with the reusable products consideration should be given to the costs associated with product disposal which would help in minimising the amount of packaging associated with the product.

Recycling is usually not practised in health care institutions. However, recycling of materials such as metals, paper, glass, and plastics can result in saving the cost.

Figure 1:



The concept of reducing what is produced and what is consumed is essential to the waste hierarchy. The logic behind it is simple to understand – if there is less waste, then there is less to recycle or reuse. The process of reducing begins with an examination of what you are using, and what it is used for. The last stage of the waste hierarchy is to recycle. To recycle something means that it will be transformed again into a raw material that can be shaped into a new item. There are very few materials on the earth that cannot be recycled. Product recycling and reuse can minimise the volume of costly waste disposal streams. Health care institutions should critically examine current waste streams and determine what products can be separated out at the point of generation to be effectively recycled, e.g. glass, plastics, aluminium cans, paper and cardboard, ferrous and non-ferrous metals. The most preferred action is

avoidance or deduction of waste generation, placed at the top of pyramid (see the Table). Reuse and recycle will further decrease the amount of waste generated, making treatment and final disposal of waste manageable. Reuse may involve a combination or all of the following steps: cleaning, decontamination, reconditioning, disinfection and sterilisation. After use, these should be collected separately from non-reusable items, carefully washed and may then be sterilised.

2.5.2 Advantages of Waste Reduction³⁸

Waste minimisation usually benefits the waste producer e.g.

- Reduced the volume and toxicity of unavoidable waste.
- Improved transportation, storage, treatment and disposal of waste.
- Proper containment of hazardous materials.
- Prompt removal of hazardous materials from the workplace.
- Liabilities associated with the disposal of such waste are lessened.
- Long-term economic benefit.

2.5.3 Waste Collection and Segregation

One of the important steps in the entire process of bio-medical waste management is the collection and segregation of it. In fact, proper collection and segregation would help in reducing the chance of spreading the infection. Therefore, special attention is to be given to the relatively small quantities of infectious and hazardous waste, which will also help in reducing the cost of handling, treatment and disposal. For example, if general waste gets mixed with infectious waste, the whole waste has to be incinerated which may prove to be costly. Waste should be collected and segregated at the site of generation itself. Segregation is the “separation of different types of wastes by sorting or the systematic separation of biomedical waste

³⁸ Anantpreet Singh and Sukhjot Kaur, *Biomedical Waste Disposal* pg. 38 (Jaypee Brothers Medical Publishers (p) Ltd. 1st Edn., 2012).

into designated categories.”³⁹ This stage is the key to the whole management process, because it is at this stage that wastes are segregated as hazardous and non-hazardous, thus minimising the risks to staff and public as well as resources used for the treatment purpose. The underlying principles in any waste segregation program are⁴⁰:

- To reduce the volume of hazardous waste destined for special treatment or expensive off-site disposal.
- To maintain safety standards during handling, transportation and treatment.
- To eliminate the need for waste segregation to occur at disposal sites.
- To facilitate the recycling process.

2.5.4 Sharp Management

While involving in the task of segregation proper care must be taken in the management of sharp. Sharp can be defined as objects that are capable of puncturing and cutting due to any points or proturbences and includes syringes, needled, scalpels, blades, pasteur pipettes and broken glass or plastic. Sharps needs special attention while segregating and storing because needles can act as a reservoirs of pathogens in which the pathogens may survive for a long time because of the presence of blood and also that the sharps can provide a direct route into the bloodstream by puncturing the skin. In fact, 98% of the health facilities generate sharp waste⁴¹. Sharps whether contaminated or not, should be collected together in puncture proof covered containers usually made of metal or high density plastic. Dense cardboard can also be used at places where metal or high density plastic is costly or unavailable. Containers should be rigid and impermeable so that they can retain any residual liquid from the syringes along with the sharps. Needles and syringes should be rendered unusable and containers should be temper proof in order to discourage abuse.

³⁹ *Ibid* at pg. 42.

⁴⁰ Vijay P. Singh and Ramnarayan Yadava (Eds.), *Wastewater Treatment and Waste Management* pg. 365 (Allied Publishers Pvt. Ltd., New Delhi, 2003)

⁴¹ George Nwabuko Chima, I. Clinton Ezekwe, *et. al.*, “An Assessment of Medical Waste Management in Health Institutions in Yenagoa, South-South, Nigeria” pg. 8 *World Review of Science, Technology and Sustainable Development* (2011).

2.5.5 Waste Containers

The key principle of successful and safe waste containers is correct source separation/segregation. Strong containers should be used, preferably lined with tie-off plastic bags and handled mechanically. When using rigid, non-lined plastic containers, they must be mechanically discharged, and when cleaning, care should be taken to avoid spraying of the same from exposure. All waste containers/bags must be colour-coded. Colour coding makes it easier for medical staff and hospital workers to put waste items into the correct container, and to maintain segregation of the wastes during transport, storage, treatment and disposal. Colour coding also provides a visual indication of the potential risk posed by the waste in that container.

Table 4

WHO-recommended segregation scheme⁴²

Type of waste	Colour of container and markings	Type of container
Highly infectious waste	Yellow, marked "HIGHLY INFECTIOUS" with biohazard symbol	Strong, leak-proof plastic bag or container capable of being autoclaved
Other infectious waste, pathological and anatomical waste	Yellow with biohazard symbol	Leak-proof plastic bag or container
Sharps	Yellow, marked "SHARPS", with biohazard symbol	Puncture-proof container
Chemical and pharmaceutical waste	Brown, labeled with appropriate hazard symbol	Plastic bag or rigid container
Radioactive waste	Labelled with radiation symbol	Lead box
General health-care waste	Black	Plastic bag

⁴² Yves Chartier, Jorge Emmanuel, *et. al.*, *Safe management of wastes from health-care activities* pg. 79 (WHO Press, World Health Organisation, 2nd Edn., 2014).

2.5.6 Labelling

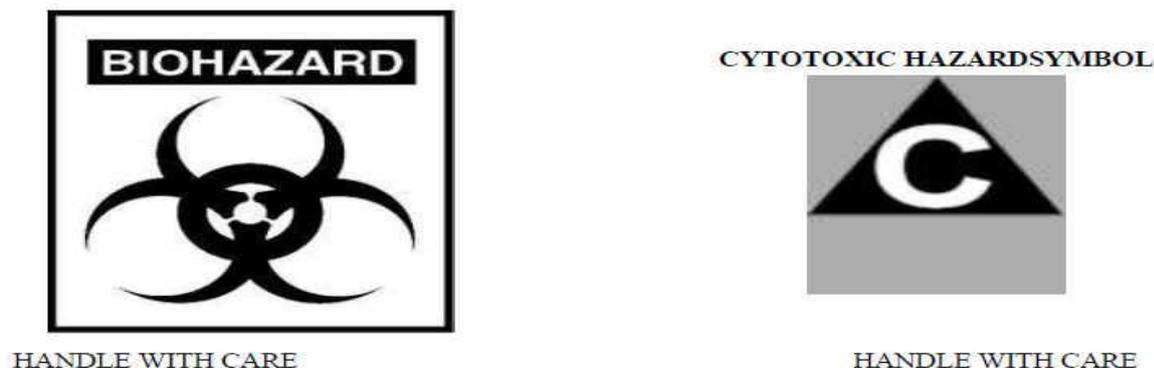
Labelling is essential in the correct identification and safe management of medical waste. It makes easy to understand the different categories of wastes. By way of raising awareness the health care personnel would be in a position to identify the type of waste contained in the bag or container which is to be made prior to the collection of biomedical waste. It would be better if bags and bins provided are already labeled with the appropriate hazard symbols e.g. biohazard, cytotoxic hazard symbols etc. This will help in waste audit conducted at treatment and disposal site to identify those areas that are in compliance or non-compliance with the required hospital waste management practices. Biohazard includes medical waste or samples of a microorganism, virus or toxin and also substance which are harmful to other animals. Cytotoxic waste typically includes all drug administrative equipment (eg. needles, syringes, dripsets etc.) as well as all gowns and body fluids/waste from patients undergoing such treatment. Examples of radioactive waste arising from clinical, medical and biological research activities are contaminated materials and syringes generated from nuclear medicine procedures, unused radioactive seeds from implants in radiation oncology as well as sealed sources used for calibration purposes, which are no longer useful.

Therefore, before treatment and disposal of biomedical wastes under various categories, the most important and vital task that should be borne in mind, is the segregation process. This process is so important that any negligent act at the segregation stage may result in spread of infections causing different diseases which is not curable in nature. Regarding infectious or hazardous wastes special attention must be given. It is also essential that a person must be appointed who will be responsible for the potentially infectious waste segregation programme. The institution that generates bio-medical waste should adopt universal precautions and appropriate safety measures while doing therapeutic and diagnostic activities and also while handling the bio-medical waste.

Different symbols/labelling on the containers/bags

Figure 2

1. Symbols for Biohazard and Cytotoxic Hazards



2. Symbol for Radioactive Waste



2.5.7 Storage

Storage of biomedical waste is necessary at two places⁴³:

- The place where waste is generated,
- Common storage area for total waste of an organisation.

While storing each waste must be put into the appropriate coloured bags. When the bag or the container is sealed for transportation/treatment appropriate label should be provided on it. Label must contain “biohazard” symbol, name of department/ward where waste is generated. It should also contain details of both

⁴³ National Institute of Industrial Research Consultant & Engineers, *Medical, Municipal and Plastic Waste Management Handbook* pg. 83 (NIIR, Delhi).

sender and receiver over it along with the details of person who can be contacted in case of emergency. Staff should ensure that waste bags are tightly closed or sealed when they are three-quarters full. Bags should not be closed by stapling. Sharp should be placed inside labelled yellow infectious health care waste bag before it is mobilised from the hospital area. A designated area inside the health care institute should be used as central storage facility. However, the hospital waste may need to be stored if immediate treatment and disposal cannot be done. These wastes should be refrigerated at a temperature preferably no higher than 3 °C to 8 °C if stored for more than week⁴⁴ on-site to prevent rolling and offensive smell, needless to say that the duration of storage for refrigerated or frozen biomedical waste varies according to storage capacity, rate of waste generation and any other applicable local regulatory requirements. Waste may be stored off site before treatment and final disposal. Such area need to be notified by the government authority. All storage sites must be concrete and should be designed to allow wash out with the help of water. In doing so the following caution must be borne in mind:

- Infected glass or plastic items may fracture at lower temperatures.
- Untreated infectious waste or waste with a high content of blood or other body fluids destined for off-site disposal (for which there is a risk of spilling) should never be compacted to decrease its volume.
- Cytotoxic waste should be kept in a specific secure location separate from other healthcare waste.
- Radioactive waste should be stored in lead containers to prevent dispersion. Waste that is to be stored till its radioactivity decay completes, should be labeled with the type of radionuclide, date and detailed data of required storage conditions.
- The decay storage time for radioactive waste should be until the radioactivity is substantially reduced and the waste can be safely disposed of as normal waste. A minimum storage time of 10 half-

⁴⁴ Prerna Thareja, Brijendra Singh, *et. al.* “Biomedical Waste Management: Need for Human Civilisation” Vol. 2 Indian Journal of Clinical Anatomy and Physiology pg. 71 (April –June 2015).

life times for radioisotopes in wastes with a half-life of less than 90 days is a common practice⁴⁵.

It is to be noted that the World Health Organisation (WHO) has recommended for the central storage facility with the criteria as referred in Table the below:

WHO's recommendation for Central storage facility for health care waste⁴⁶

1. The storage area should have an impermeable, hard-standing floor with good drainage, it should be easy to clean and disinfect.
2. There should be a water supply for cleaning purposes.
3. The storage area should afford easy access for staff in charge of handling the waste.
4. It should be possible to lock the store to prevent access by unauthorized persons.
5. Easy access for waste collection vehicles is essential.
6. There should be protection from the sun.
7. The storage area should be inaccessible for animals, insects and birds.
8. There should be good lighting and at least passive ventilation.
9. The storage area should not be situated in the proximity of fresh food stores or food preparation areas.
10. A supply of cleaning equipment, protective clothing and waste bags or containers should be located conveniently close to the storage area.
11. Floors, walls and ceiling of storage area must be kept clean in accordance to established procedures at least once per week.
12. Should have spillage containment equipment.

2.5.8 Transportation

Wastes are to be collected and deposited from clearly sign posted and designated collection points in hospital wards with the help of specially designed vehicle. Where open trolleys are used to collect containers or bags of waste from bin,

⁴⁵ Yves Chartier, Jorge Emmanuel, *et. al.*, *Safe management of wastes from health-care activities* pg. 71 (WHO Press, World Health Organisation, 2nd Edn., 2014).

⁴⁶ *Ibid* at pg. 89.

each bin and trolley must be thoroughly cleaned and disinfected with a hypochlorite solution at least once a week. The appropriate authority shall evolve a protocol of safe transportation of such wastes taking into account various local factors, and make available a copy of the same to every authorised person. The health care establishments waste disposal strategy should include procedures for on-site and off-site transport of wastes.

2.5.8.1 On-site Transportation

This should be done by means of wheeled trolleys, containers or carts. These vehicles should be used for this purpose only for the movements of the waste bags/containers which should be placed securely in it. Transportation of waste should be done in compliance with the rule which specifies that the handlers must be provided with uniform and personal protective equipments such as apron, boots, gloves and masks, should be compulsorily followed. For on-site transport, the following points should be kept in mind and applied properly:

- The trolleys or handcarts must be designed in such a way so that it can prevent spills and should also be made of materials which can withstand exposure to common cleaning agents.
- Such trolleys should be easily cleaned, disinfected daily with an appropriate disinfectant.
- The biohazard symbol should be clearly displayed on carts.
- Transport of clinical and related wastes should be separate from general traffic.
- Chutes must not be used for the transport of clinical and related wastes. Waste disposal chutes should not be incorporated in the design of new hospitals.

2.5.8.2 Off-site Transportation

Off-site transportation is required when hazardous healthcare waste is treated outside the healthcare establishment. This requires the labelling of the healthcare waste displaying its nature and source so that if accident takes place, it would be

possible to identify the particular waste and accordingly appropriate measures can be taken. The following issues should be borne in mind:

- Vehicles used for transporting clinical and related wastes should be reserved for this purpose wherever possible.
- Vehicles must be easy to load, unload and clean and should be equipped with spillage collection sumps or other suitable spill controls.
- The driver's cabin in vehicles should be physically separated from the waste.
- The design of the vehicle should afford the driver and the general public to provided protection in the event of accident.
- Vehicles should also have provision for holders to display prominently the necessary warning symbols.

2.5.9 Treatment and Disposal

The term 'treatment' refers to the process of modifying the waste in some way before it is taken to its final resting place. Treatment is required to decontaminate or disinfect the waste at source so that it no longer acts as the source of pathogenic organisms. After such treatment, the residual matter can be safely handled, transported and stored. The choice of treatment method should be decided according to⁴⁷:

- a. The type, nature and volume of the wastes.
- b. The hazard and viability of the pathogenic organisms in the waste.
- c. The efficiency of the treatment method.
- d. The conditions at which the treatment method operates.
- e. The cost-effectiveness of the treatment method.

There are five basic processes for the treatment of hazardous components in health-care waste, in particular, sharps, infectious and pathological wastes, they are: mechanical, thermal, chemical, irradiation, and biological. In addition to these landfill and burial may be consider as a process as part of the treatment process. For proper

⁴⁷ *Ibid* at pg. 69.

understanding of treatment of biomedical waste it has divided into ten broad categories of treatment technologies.

1. Mechanical Processes,
2. Thermal Processes,
 - a. Autoclaving and Hydroclaving,
 - b. Microwave Treatment,
 - c. Incineration,
 - d. Plasma Systems,
3. Chemical Processes,
4. Irradiation Processes,
5. Biological Processes and
6. Landfill or Burial.

2.5.9.1 Mechanical Process

These processes are used to change the physical form or characteristics of the waste either to facilitate waste handling or to process the waste in conjunction with other treatment steps. The two primary mechanical processes are

- **Compaction** - used to reduce the volume of the waste.
- **Shredding** - used to destroy plastic and paper waste to prevent their reuse. Only the disinfected waste can be used in a shredder. In most instances, mechanical processes are not stand-alone health-care waste-treatment processes, but supplement other treatment methods. Mechanical destruction can render a waste unrecognizable and can be used to destroy needles and syringes (depending on the type of shredding)⁴⁸.

2.5.9.2 Thermal Process

These processes utilise heat to disinfect. They represent most treatment facilities in use across the world. Depending on the temperature they operate it is been grouped into two categories, which are Low-heat systems and High-heat systems. This sub-classification is useful because of the marked differences in the

⁴⁸ *Ibid* at pg. 107.

thermo-chemical reactions and physical changes taking place in the wastes during their treatment in the different types of equipment. Low-heat systems (operates between 93-177°C)⁴⁹ use steam, hot water, or electromagnetic radiation to heat and decontaminate the waste. Examples are:

- **Autoclaving** – It is a low heat thermal process and it uses steam for disinfection of waste. Autoclaves are of two types depending on the method they use for removal of air pockets are gravity flow autoclave and vacuum autoclave.
- **Microwaving**- is a process which disinfects the waste by moist heat and steam generated by microwave energy.

High-heat systems (operates between 540-8,300°C⁵⁰) employ combustion and high temperature plasma to decontaminate and destroy the waste. Examples are:

- **Hydroclaving** - steam treatment with fragmentation and drying of waste.
- **Incineration**- It is a high temperature, dry oxidation technique. This process involves the combustion of waste under controlled conditions. In this, waste is converted into inert gases and material. This treatment is done at 800-1100° C temperature. Generally, rotary kiln having multiple hearths or controlled air types incinerators are used for heating up. According to rules, this method has been recommended for cyto-toxic drugs, human anatomical waste, discarded medicines, animal waste, and soiled waste. This is one of the advantages of this technique that it can be used for a variety of biomedical waste. Disadvantage of this technique is the production of ash and combustion by-products during treatment. Limitation: This is a very high cost technique.⁵¹
- **Plasma System**- This is another thermal disintegration method for carbonaceous materials in oxygen starved environment. It works on the principle of converting electrical energy into heat energy. In this method primary chamber pyrolysis takes place at 1100° C and the secondary chamber

⁴⁹P. Dhruv Hirani, R. Krish Villaitramani *et. al.*, “Biomedical Waste: An Introduction to its Management” Vol. 1 International Journal of Innovative Research in Advanced Engineering (IJIRAE) pg. 85 (Sept. 2014).

⁵⁰*Ibid.*

⁵¹ Anurag Sharma, Ravish Garg, *et. al.*, “A Study about Knowledge, Attitude, Practices and Technologies of Biomedical Waste Management Techniques” Vol. 9 IOSR Journal of Environmental Science, Toxicology and Food Technology pg. 76 (Dec. 2015).

combustion takes place at 950 to 1100°C. Advantage of this method is that lesser number of POPs (Persistent Organic Pollutants) are formed, also it is a compact smoke free technology and consumes less space. But, has a disadvantage of its high cost and high requirement of technical persons⁵².

- **Gasification Technique** -This process operates with the substoichiometric air level. In this, waste is heated at 500-1600°C with O₂ and H₂O as gasification agent at 1-45 bar pressure, depending upon the type of waste. This technique has same disadvantages as incineration technique⁵³.

2.5.9.3 Chemical Process

Chemical treatment methods use disinfectants such as dissolved chlorine dioxide, bleach (sodium hypochlorite), peracetic acid, lime solution, ozone gas or dry inorganic chemicals (e.g. calcium oxide powder). Chemical treatment is performed by using 1% hypochlorite solution with a minimum contact period of 30 minutes. This treatment is used for the infectious waste only⁵⁴. Chemical processes often involve shredding, grinding or mixing to increase exposure of the waste to the chemical agent. In liquid systems, the waste may go through a dewatering section to remove and recycle the disinfectant. Besides chemical disinfectants, there are also encapsulating compounds that can solidify sharps, blood or other body fluids within a solid matrix before disposal. Another example of a chemical process is a system that uses heated alkali to digest tissues, pathological waste, anatomical parts and animal carcasses in heated stainless-steel tanks⁵⁵.

2.5.9.4 Irradiation processes

These processes expose wastes to ultraviolet or ionizing radiation in an enclosed chamber. These systems require post shredding to render the waste unrecognizable. Irradiation treatment encompasses designs using irradiation from

⁵² *Ibid.*

⁵³ *Ibid.*

⁵⁴ *Ibid.*

⁵⁵ Yves Chartier, Jorge Emmanuel, *et. al.*, *Safe management of wastes from health-care activities* pg. 106 (WHO Press, World Health Organisation, 2nd Edn., 2014).

electron beams, cobalt-60 or ultraviolet sources. These technologies require shielding to prevent elevated occupational exposures to electromagnetic radiation. The pathogen destruction efficacy depends on the dose absorbed by the mass of waste. Electron beams are powerful enough to penetrate waste bags and containers. Germicidal ultraviolet radiation has been used to destroy airborne microorganisms as a supplement to other treatment technologies, but is not able to penetrate closed waste bags⁵⁶.

2.5.9.5 Biological processes

These processes are found in natural living organisms but refer specifically to the degradation of organic matter when applied to health-care waste treatment. These processes use biological enzymes for treating medical waste. It is claimed that biological reactions will not only decontaminate the waste but also cause the destruction of all the organic constituents so that only plastics, glass, and other inert will remain in the residues. Composting and vermiculture (digestion of organic wastes through the action of worms) are biological processes and have been used successfully to decompose hospital kitchen waste, as well as other organic digestible waste and placenta waste⁵⁷.

2.5.9.6 Land fill or Deep Burial

In all waste systems, the removal of the remaining health-care waste materials after minimisation or treatment will require access to land for final disposal. In less developed areas, where a municipality or health-care facility lacks the means to treat wastes before disposal, the direct use of a landfill is likely to be required for much of the material produced. The alternative is often an accumulation of health-care waste at medical facilities where it is openly burnt or spread indiscriminately around the facility's grounds. This constitutes a far higher risk of transmission of infection than

⁵⁶ *Ibid* at pg. 107.

⁵⁷ *Ibid*.

controlled disposal in a land disposal site; even if the land disposal site is not designed to the precise standards used in higher income places.

2.6 An Overview

In the above scenario, realising the seriousness of the problems associated with bio-medical waste it is important to make effective provisions for the scientific management of it. Although such waste constitutes a small portion of total municipal waste, there is a need to take appropriate measures for the proper handling, treatment and disposal as it consists of highly toxic and infectious substance and this give rise to the question of effective management for the same and it can be possible with the help of proper and effective laws on the subject.

CHAPTER III

THE QUEST FOR THE BIO-MEDICAL WASTE MANAGEMENT UNDER THE INTERNATIONAL ENVIRONMENTAL REGIME: AN OVERVIEW

“Tragic consequences will surely follow tomorrow our failure to act today”- Lester B. Pearson, Recipient of Nobel Peace Prize, 1957

The beginning of the present ecological era started at the end of 1960s when after the end of the World War II the need was felt for the global economic development to reconstruct the world. Although such development was unequal with differences in wealth between countries but it was always at the cost of the natural environment. The unprecedented use of exhaustible natural resources such as clean water, air, flora and fauna and minerals by these countries of the world, especially by the developed countries to make the development faster in the name of establishing industries and to satisfy the various needs of mankind resulted in the imbalances in the environment. Therefore, people of the world increasingly demanded action to protect the quantity and quality of the components of the environment for the purpose of maintaining the balance in the environment and this gave rise to the global concerns for environmental crisis that led to the evolution and remarkable growth of international environmental law.¹

International law signifies the ‘laws of nations’ that States feel themselves bound to observe within the structure of law for governing the relationships among the States. Comprising in greater part the principles and rules of conduct under the international law, at one time, states were the only entities enjoying international legal personality having rights and duties, but today, international organisations, non-state groups and individuals are also seen as being international legal entities in certain situations. The scope of international law is still evolving and as part of its evolution international environmental law has intensely evolved as a new branch of international law to address the new environmental challenges which directly concerned with developmental issues.

¹ Philippe Sands, *Principles of International Environmental Law* pg. 35 (Cambridge University Press, UK, 2nd Edn., 2003).

The term ‘international environmental law’ consists of those substantive, procedural and institutional rules of international law which have as their primary objective the protection of the environment i.e. from the whole biosphere to the habitat of the smallest creature or organism. Environment is generally defined as the objects or the region surrounding anything.² The root for the protection of environment under the international environmental law for the first time can be found in an agreement relating to international fishing treaties and the agreements to protect various plant species, but their primary purpose was to sustain the harvesting of economically valuable species. However, genuine measures of environmental protection appeared only during the second half of the 20th century. A brief glance at the period prior to the development of modern international environmental law indicates the significance of current international legal norms. On the importance of International environmental law the Commission on International Development known as Pearson Commission in its report in 1969:

“Who can now say where his country will be after a few decades without asking where the world will be. If we want a safe and prosperous world, we will have to take into account common problems of people.”³

The Commission⁴ listed ten objectives in its report which can be regarded to be the standards of development to be observed by the countries of the world. Therefore, before adopting developmental aspects by the international community they have to be united through general international law, conventions and conferences for the purpose of protecting the global environment. In the following discussions focus has been made on the history and development of international environmental law dividing the aspect into pre-Stockholm, the Stockholm Conference and post-Stockholm period in order to get the detail idea on the subject.

² The Encyclopedia Britannica defines the environment as “the entire range of external influence acting on an organism, both the physical and biological and other organism, i.e. forces of nature surrounding on individual.

³ Dr. S. K. Kapoor, *International Law* pg. 390 (Central Law Agency, Allahabad, 12th Edn., 2008).

⁴ The Pearson Report, A New Strategy for Global Development, The UNESCO Courier, (February, 1970) Available at: <http://unesdoc.unesco.org/images/0005/000567/056743eo.pdf> (Last visited on July 3, 2016).

3. History and Development of International Environmental Law

International environmental law is a field of international law that regulates the behaviour of States and international organisations with respect to the environment. Although Stockholm Conference of 1972 is considered as the first steps towards the modern international environmental law by the member countries of the world but its roots can be found in different conventions held prior to 1972. If we turn back to the past centuries, we find different Conventions held for the preservation of biodiversity, protection of endangered species, and protection of human environment from pollution etc. Therefore, it is essential to understand the development of international environmental regime in the light of the following perspectives.

3.1 Pre-Stockholm Development

As mentioned above that the concern for the environment had first begun to appear on the international agenda during the twentieth century through a number of international conventions. A brief overview of the various Conventions held on different environmental subjects has been discussed herein under to get a detail idea.

3.1.1 Conventions Concerning Water and various Species

The various conventions relating to water and different species have been discussed below:

- I. Convention for the Protection of Useful Birds to Agriculture, 1902.** It was the first global convention to enter into force for the protection of designated species of wildlife.⁵ An even earlier Convention for the Preservation of Wild Animals, Birds and Fish in Africa (May 19, 1900). The Convention concerned useful birds, especially insectivores, and was aimed primarily at enhancing agricultural production.

- II. The Fur Seal Treaty of 1911.** Signed on July 7, 1911 the treaty had aimed at adopting effective means for the preservation and protection of the fur seals which frequent the waters of the North Pacific Ocean. This was the first international Convention to outlaw open-water seal hunting by

⁵ Alexandre Kiss and Dinah Shelton, *International Environmental Law* pg. 39 (Transnational Publications, New York, 3rd Edn., 2004).

acknowledging the United States jurisdiction in managing the on-shore hunting of seals for commercial purposes. It was the first international treaty to address wildlife preservation issues also. Consisting of XVII Articles the Convention highlighted on the different aspects for the protection of such sea animals.

III. Convention Concerning the Use of White Lead in Painting, Geneva, 1921⁶ was to protect workers from exposure to white lead and sulphate of lead and of all products containing these pigments. To prohibit the use of white lead, sulphate of lead and of all products containing these pigments in the internal painting of buildings, except where such use is considered necessary by the competent authority after consultation with the employers and workers organization concerned.

IV. Convention for the Regulation of Whaling, 1931. The exploitation of whales has spread over the centuries and not until the 20th century attempts was made to regulate the whaling throughout the world. The first positive attempt in this regard was made in 1931 when the Convention was signed in Geneva and came into force on Jan. 16, 1935⁷. It applied to all waters, including both the high seas and national and territorial waters. The Convention was only applicable to baleen whales and provided exemptions for aboriginal subsistence whaling. The Convention also prohibits the taking of right whales, calves or suckling whales, immature whales, and females accompanied by calves or suckling whales. It also provided for the licensing of whaling vessels and the collection of statistics of the catches.

Apart from the above mentioned early conventions, several early boundary water treaties contain measures against water pollution. In 1909, a treaty between the United States and Great Britain concerning the boundary water between the United States and Canada was considered a model. It is still in force and was expanded

⁶ Date of Adoption: 25.10.1921, Geneva.

⁷ Ray Gambell, "International Management of Whales and Whaling: A Historical Review of the Regulation of Commercial and Aboriginal Subsistence Whaling" Vol. 46 Arctic pg. 97 (June, 1993).

during the 1970s. Under Article VII of the treaty, the contracting parties agreed to establish an International Joint Commission having jurisdiction over all cases involving the use or obstruction or diversion of the boundary water. In 1918, the Commission found that the water of the Detroit and Niagra Rivers were being polluted, and it recommended that no untreated sewage from the cities or towns should be discharged into the boundary water. Consequently, a draft treaty was prepared to carry out the said recommendations of the Commission based on the principle of ‘*sic utere tuo*’⁸ which had received recognition in *Corfu channel*⁹ case by the International Court of Justice.

During the two World Wars also States entered into a growing number of boundary water agreements. These efforts continued after World War II, especially in Central and Eastern Europe. Some States, like the former Yugoslavia, concluded a network of bilateral agreements to regulate the utilisation of waters through the creation of international commissions. In 1950, Belgium, France and Luxembourg concluded the first treaty entirely dedicated to countering freshwater pollution.¹⁰ In addition to the above the following are such Conventions relating to seas.

V. The Convention of the High Seas, 1958 was the next step for the prevention of pollution on the high seas. Desiring to codify the rules of international law relating to high seas and recognising that the United Nations Conference on the Law of the Sea, held at Geneva from 24th February to 27th April, 1958¹¹, all the participating nations had adopted that every State, whether coastal or not, has the right to sail ships under its flag on the high seas and every State shall take certain necessary measures for ships under its flag to ensure safety at sea. Also every State shall draw

⁸ It means no State is allowed to alter the natural condition of its territory to the disadvantage of natural conditions of the neighbouring State, adding that a State is not only forbidden to stop or divert the flow of a river which runs from its own to a neighbouring State, but likewise to make such use of water of the river as causes danger to the neighbouring State, or prevent it from making proper use of the flow of the river on its part- Oppenheim, *International Law* pg. 475 (Universal Law Publishing Co. Pvt. Ltd., Delhi, 8th Edn., 1955).

⁹ Report 4 of the International Court of Justice Report (1949), wherein it was decided that fundamental principle of international law, limits action by one state which would cause injury in the territory of another State.

¹⁰ Alexandre Kiss and Dinah Shelton, *International Environmental Law* pg. 41 (Transnational Publications, New York, 3rd Edn., 2004).

¹¹ Dr. P. C. Sinha and K. Cherry, *International Encyclopedia of Environmental Laws* pg. 256 (Anmol Publication Pvt. Ltd., New Delhi, 1st Edn., 1996).

up regulation to prevent pollution of the seas by the discharge of oil from ships and its subsoil, taking into account existing treaty provisions on the subject.

VI. In another Convention, namely, **Convention on Fishing and Conservation of the Living Resources of the High Seas, 1958**¹² the main issue of discussion was that how development of modern techniques for the exploitation of the living resources of the sea and increasing man's ability to meet the need of the world expanding population for food have exposed some of those resources of the sea to the danger of over exploitation. It was also considered in that Convention that how such problem was to be solved on the basis of international co-operation. Some of the other international convention relating to high seas such as International Convention Relating to Intervention of the High Seas in Case of Oil Pollution Casualties, 1964, International Convention for the Conservation of Atlantic Tunas 1966 deserved special mention.

VII. The Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, 1972 was a regional Convention under which an agreement was signed by 12 Western European States as applied to North East Atlantic and parts of Arctic Ocean. It was the first international agreement to control dumping. The Oslo Convention was followed by London Convention on Dumping 1972 to apply universally. That is to say, it applies to seas everywhere. It applies to high seas and territorial sea but it exempts internal waters. The parties of both Conventions agreed to take measures to prevent pollution of the sea by dumping of harmful wastes and to harmonise their policies in this regard. Both the Conventions made the absolute prohibition of dumping.

3.1.2 Convention Concerning Fauna and Flora

The history of international environmental laws concerning fauna and flora can be trace back during 1930s when some genuinely ecological approaches emerged

¹² Alexandre Kiss and Dinah Shelton, *International Environmental Law* pg. 37 (Transnational Publications, New York, 3rd Edn., 2004).

with the adoption of two regional instruments that can be said as predecessor to the present day environmental jurisprudence. One of such conventions was **Convention Relating to the Preservation of Fauna and Flora in their Natural State** held in London in 1933. This Convention was held with a purpose to ensure protection to the natural fauna and flora from ecological disturbance in ‘national parks’¹³ within the territories to which it applied. However, it provided for the creation of national parks and strict protection for some species of wild animals. It also included measures regulating the export of hunting trophies and banned certain methods of hunting.

Another Convention, namely **Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere, 1940** envisages the establishment of reserved and the protection of wild animals and plants, especially migratory birds; however, the main provisions of the Convention are more general and less restrictive than those of the London Convention.

The convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973 aims at ensuring that the international trade in plants and animals should not threaten their survival. It also provides a framework for addressing the illegal trade of the wild animals by placing illegal wildlife trafficking among the top ten most lucrative criminal activities worldwide. The purpose of the Convention as stated in the first paragraph of its preamble is to protect wild fauna and flora for current and future generations. Wild fauna and flora are described as an irreplaceable part of the natural systems of the earth and is valuable from aesthetic, scientific, cultural, recreational and economic points of view.

3.1.3 Conventions Concerning Petroleum and its Products

The early part of the 20th Century also witnessed the expansion of imports and exports of petroleum business and the demand for petroleum products and its supply gave rise to a new problem of oil pollution in harbours and coastal regions. To cope up with the problem, in 1922, Great Britain took first initiative in prohibiting the deliberate discharge of oil in its inland waters and territorial sea. But that was applicable only in case of discharge beyond 3 miles from shore. The then U. S.

¹³ Dr. Indranil Bhattacharya, *Textbook of Environmental Laws* pg. 29 (Kamal Law House, Kolkata, 1st Edn., 2009).

President also on the basis of the request made by the Congress called a conference of maritime nations to adopt effective means to reduce the pollution of marine water.

Subsequent efforts to combat marine pollution appeared again during the 1950s. **The 1954 International Convention for the Prevention of Pollution of the Sea by Oil**, was the first important step in this direction. After the World War II, in the wake of the resurgence of maritime trade involving the increasing use of petroleum products, the incidents of deliberate or accidental discharge of oil into the sea from the ship was not numerous. In this backdrop, the delegates from 32 States met in London in 1958 to discuss the issue and the outcome is the **International Convention for the Prevention of Pollution by Ships, London**¹⁴. The Convention was later modified and reinforced, then replaced in 1973 by a much more detailed and effective convention.¹⁵

3.1.4 Convention Concerning Radioactive Substances

New technologies, in particular, the use and utilisation of nuclear energy, led to the further international regulation. A 1963 treaty addressed military use of radioactive materials, banning nuclear weapons testing in the atmosphere, in outer space and under water.¹⁶ Radioactive pollution is the result of released radionuclides in the environment. It is a by-product of nuclear power generation and use of nuclear technology. Nuclear power can be used either to destroy the earth or to improve greatly the quality of life for all persons. The problems presented by such waste disposal are compounded because of its hazardous nature and require to be handled internationally and hence the importance of international Conventions on the subjects. To deal with such subject the Governments of the United States of America, the United Kingdom of Great Britain and Northern Ireland and the then Union of Soviet Socialist Republic determined to put an end to the contamination of man's environment by radio-active substance. Each of the parties has given undertaking to prohibit, to prevent and not to carry out any nuclear weapon test, explosion or any other nuclear explosion, at any place under its jurisdiction under various international treaties. They are:

¹⁴ Dr. G. S. Karkara, *Environment Law* pg. 181 (Central Law Publications, Allahabad, 2nd Edn., 2000).

¹⁵ International Convention for the Prevention of Pollution by Ships, London, Nov. 2, 1973.

¹⁶ Treaty Banning Nuclear Weapons in the Atmosphere in Outer Space and Underwater, Moscow, Aug. 5, 1963.

I. Antarctic Treaty, 1959 prohibits nuclear explosions and disposal of radioactive waste materials in Antarctica and provides for inspection of all the areas in the Antarctic by observers of the contracting states.

II. Nuclear Test Ban Treaty, 1963 provides for putting an end to the contamination of man's environment by radioactive substances and permits no nuclear explosions in the three parts of the biosphere, namely, atmosphere, outer space, under water, including territorial waters or high seas.

III. Treaty on the principles governing activities of the states in the exploration and use of outer space including the moon and other celestial bodies in 1967 provides that it is the duty of every state launching an object into an orbit or beyond to take precautions or to avoid injury to other states or other permanent change in the environment of the earth or the contamination of the upper atmosphere and outer space and the celestial bodies and the earth.

IV. The Treaty for the Prohibition of Nuclear Weapons in Latin America (Talteloco Treaty), 1967, is an outcome of a growing concern about the danger to integrity of human species caused due to continuous release of radioactive elements by nuclear weapons. Under this treaty, the contracting parties have agreed to carry out explosions of nuclear devices for peaceful purposes. The treaty also put stress to convey the fullest possible information on any possible radio-active fall out and also measures as taken to avoid dangers to the population of flora, fauna and territories of party or parties to the treaty.

V. The Treaty on the Non-Proliferation of Nuclear Weapons, 1968 encourages further the resolution as taken by the parties to the 1963 Nuclear Test Ban Treaty seeking to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end for the purpose of prevention of wider dissemination of nuclear weapons. In this treaty, State parties have undertaken to fulfill an obligation for not to transfer nuclear weapon and explosive devices and not to encourage, assist or induce

any non-nuclear weapon State to manufacture or acquire the same. Thereafter Nuclear Test Ban Treaty, 1969 provides for putting an end to the contamination of man's environment by radio-active substances and permits no nuclear explosions in the three parts of the biosphere, namely atmosphere, outer space and underwater including territorial water or the high seas.

VI. The Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Sea-bed and Ocean Floor and in the Subsoil thereof, 1971, the parties to the treaty have made a solemn promise not to implant or emplace any nuclear weapons or any other types, of mass destruction or any structures including any launching installations; or facilities for storing, testing or using such weapons on the sea-bed, ocean floor, or subsoil beyond 12 miles from their shore baselines.¹⁷

3.2 Stockholm Conference-A Way Forward

Prior to the Stockholm conference the various international conventions and conferences held from time to time had only focused specifically on some environmental issues. Many countries had entered into bilateral and multilateral treaties which although were considered as important and negotiated to protect the environment but were inadequate. Such conferences were more regional rather than international and thereby suffered from lack of effective implementation. The establishment of large number of international and regional organisations during these periods that became part and parcel of international community also helped in taking appropriate steps towards improving the quality of life and conserve common resources. But unfortunately, these organisations are beset with divided or ineffectual authority, making corrective actions without the consent of offending governments virtually impossible. The other factors which are discussed below also prompted the world community to take immediate steps under a common platform under which the countries of the world would be in a position to unite together to tackle the threat of environmental pollution. The Stockholm conference is one of such platform to meet the demand of the hour considering the danger involved in it. But before highlighting

¹⁷ Alexandre Kiss and Dinah Shelton, *International Environmental Law* pg. 41 (Transnational Publications, New York, 3rd Edn., 2004).

on the Stockholm conference let us look at the historical background which had helped in the formation of the common platform to combat the environmental issues.

3.2.1 Historical Background

Ecological catastrophe such as the 1967 “black tide” off the coasts of France, England and Belgium, caused by the grounding of the oil tanker Torrey Canyon and later on, the 1971 Minamata case on river pollution by organo-mercury in Japan and a growing public awareness of the world eco-crisis, alerted by media attention emphasized the need to convene a world conference on environment immediately and effectively. On 13 December 1967, a proposal reached the United Nations General Assembly to organise a conference in order to "facilitate co-ordination and to focus the interest of member countries on the extremely complex problems related to the human environment." It was the Swedish delegation, led by Sweden's U.N. Representatives Sverker Astrom and Borje Billner, who took the initiative to convene the first United Nations Conference on the Human Environment (UNCHE) in its capital city of Stockholm in 1972¹⁸. Representatives from 113 nations and over 400 non-governmental organizations (NGOs) attended the Stockholm Conference.

3.2.2 The Stockholm Declaration on Human Environment

The Conference popularly known as Stockholm Conference was convened to “examine national and international actions that could limit and eliminate, as far as possible, obstacles to the human environment”¹⁹ and to “provide a framework for comprehensive consideration within the U.N. of the problems of the human environment in order to focus the attention of governments and public opinion on the importance and urgency of this question”²⁰. There is no doubt that the Conference raised the discussion of environmental issues to a level previously reserved to topics with a long diplomatic

¹⁸ Andreas Grieger, “Only One Earth: Stockholm and the Beginning of Modern Environmental Diplomacy”, Environment & Society Portal pg. 10 Arcadia, Rachel Carson Center for Environment and Society, (2012).

¹⁹ Andre Aranha Correa do Lago, *Stockholm, Rio, Johannesburg : Brazil and the Three United Nations Conferences on the Environment*, Ministry of External Relation pg. 25 (Brazil, 2009).

²⁰ *Ibid.*

The Stockholm Conference was called "to serve as a practical means to encourage and provide guidelines for action by governments and international organisations designed to protect and improve the human environment and to remedy and prevent its impairment, by means of international co-operation, bearing in mind the particular importance of enabling developing countries to forestall occurrence of such problems". The gathering produced the Declaration of the Conference on the human environment and an action plan discussed herein under.

The Secretary-General of the Conference, the Canadian Maurice Strong, declared in the opening ceremony that Stockholm is launching "a new liberation movement to free men from the threat of their thralldom to environmental perils of their own making"²¹. The Stockholm Declaration on the Human Environment begins with the statement that man is at once the creature and molder of his environment; the natural element and the man-made are essential to human well-being and to the full enjoyment of basic human rights, including the right to life. Protecting the human environment is also viewed as a major issue for economic development. The Declaration recognises that the natural growth of world population continuously poses problems for preserving the environment, but expresses a conviction that with social progress and the evolution of production, science and technology, human ability to improve the environment strengthens each day. The declaration noted that many factors harm the environment, including population growth, developing economies, and technological and industrial advancements. Despite the pressure placed on the environment, the declaration proffered 26 principles "to inspire and guide the peoples of the world in the preservation and enhancement of the human environment."

3.2.3 The Action Plan

An 'action plan'²² had been prepared for the protection and enhancement of the environment. This plan was in effect had taken into consideration all recommendation for international action adopted for environmental protection. Such action plan made a re-arrangement programme which involved three parts:

²¹*Ibid.* Speech delivered at the Opening Ceremony of the Stockholm Conference by Maurice Strong, Secretary General.

²² U. N. Doc. A/Conf.48/14, July 3 1972, pg. 10, cited in J. G. Starke, *Introduction to International Law* pg. 404 (Aditya Books Pvt. Ltd., New Delhi, 10th Edn., 1994).

1. An 'earthwatch' programme to identify problems of international significance so as to warn against impending environmental crisis;
2. 'Recommendation' concerning environmental management, or in other words, the application in practice of what was shown to be desirable or necessary in regard to the environment and
3. 'Supporting measures' such as education, training, public information and finance.²³

3.2.4 The Principles

Principles 2 to 7²⁴ constitute the heart of the Declaration. They proclaim that the natural resources of the globe are not only oil and minerals, but also air, water, earth, plants and animals as well as representative samples of natural ecosystems. These should be preserved in the interest of present and future generation. Man has a particular responsibility to safeguard the heritage of wildlife and its habitats. Renewable resources must maintain their ability to replenish themselves and non-renewable resources should not be wasted. In all cases the Declaration emphasises the necessity of adequate resource management. This part concludes by calling for a halt

²³ Alexandre Kiss and Dinah Shelton, *International Environmental Law* pg. 39 (Transnational Publications, New York, 3rd Edn., 2004).

²⁴ Principle I of the Stockholm Declaration- Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations.

Principle 2- The natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

Principle 3 of the Stockholm Declaration- The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

Principle 4 of the Stockholm Declaration- Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat, which are now gravely imperilled by a combination of adverse factors. Nature conservation, including wildlife, must therefore receive importance in planning for economic development.

Principle 5 of the Stockholm Declaration- The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind.

Principle 6 of the Stockholm Declaration- The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of ill countries against pollution should be supported.

Principle 7 of the Stockholm Declaration- States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

to the production of toxic wastes or other matter that cannot be absorbed by the environment.

Principles 8²⁵ to 25 address implementation of environmental protection. It states that economic and social development is indispensable if an environment favorable to the existence and work of man is to be sought. Principle 9 affirms that the best means to remedy under-development is to enhance financial and technical assistance. National environmental policies should assist the potential progress of poorer countries and they should be accorded supplementary international assistance. Principles 10²⁶ to 12²⁷ is concerning the international trade and economic consequences of environmental protection, particularly for developing countries. Principle 13 to 15²⁸ underline the necessity of integrated, coordinated and rational development planning. Demographic issues produced a simple recommendation in Principle 16 in favour of policies which respect fundamental human rights and are judged adequate by the governments concerned. Principles 18 to 20²⁹ mention other

²⁵ Principle 8 of the Stockholm Declaration- Economic and social development is essential for ensuring a favorable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

²⁶ It provides that the stability of prices and an adequate remuneration for primary products and goods is essential for the management of the environment.

²⁷ Principle 11 of the Stockholm Declaration- The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

Principle 12 of the Stockholm Declaration- Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate- from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

²⁸ Principle 13 of the Stockholm Declaration- In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and coordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve environment for the benefit of their population.

Principle 14 of the Stockholm Declaration- Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and improve the environment.

Principle 15 of the Stockholm Declaration- Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all. In this respect projects which are designed for colonialist and racist domination must be abandoned

²⁹ Principle 19 of the Stockholm Declaration- Education in environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension.

instrument of environment policy; recourse to science and technology, exchange of information, and finally, teaching information about environmental matters.

The last group of principles 21 to 26 is of particular interest in the development of international law. Principle 21³⁰ is generally recognised today as expressing a basic norm of customary international environment law. The Declaration further affirms that states should cooperate to develop international law regarding liability and compensation for victims of pollution and other environmental damage produced outside their boundaries³¹. They should define criteria and norms in environmental matters, taking into consideration the system of values prevailing in each country, in particular in developing countries.³² States should cooperate to protect and improve the environment and ensure that international organization play a coordinated, effective and dynamic role in this field.³³ The final principle condemns nuclear weapons and all other means of mass destruction.³⁴

One of the aims of Stockholm conference among other was to set guidelines for handling environmental issues by the international agencies under proper and effective international system. A number of agencies such as IAEA (for atomic energy), FAO (for agriculture and forests), UNESCO (for science) and WHO (for environmental health) already had environmental responsibilities of one kind or another. Different resolutions had agreed at the end of the conference which was an important step towards the end of a long debate relating to some issues. It was proclaimed that the developing countries, most of the environmental problems are due to improper conditions where millions are deprived of adequate food and clothing, shelter and education, health and sanitation and therefore, such countries must conform that their efforts towards development must not be cause of concern for others and they should bear in mind their priorities and the need to safeguard and improve the environment.

³⁰ States may exploit their resources as they wish but must not endanger others.

³¹ Principle 22 of the Stockholm Declaration.

³² Principle 23 of the Stockholm Declaration.

³³ Principles 24-25 of the Stockholm Declaration.

³⁴ Principle 26 of the Stockholm Declaration.

3.3 Post-Stockholm Developments

The Stockholm conference secures a permanent place for the environment on the world's agenda and led to the establishment of the United Nations Environment Programme (UNEP) to provide the UN with the institutional capacity needed to address and coordinate the recommendations put forward in the Stockholm Action Plan and to advocate for the protection and improvement of the environment.

3.3.1 United Nations Environment Programme (UNEP)

To co-ordinate different environmental activities the United Nations established an agency in the name of The United Nations Environment Programme (UNEP). It assists developing countries in implementing environmentally sound policies and practices. It was founded as a result of the Stockholm conference and has its headquarters in the Gigiri neighborhood of Nairobi, Kenya. UNEP has six regional offices and various country offices. Since its inception, it has played a significant role in the development of international environmental law. It has negotiated and obtained adoption of nearly thirty binding multilateral instruments³⁵, including the landmark 1987 Montreal Protocol on Substances that Deplete the Ozone Layer³⁶ as well as ten sets of non-binding environmental law guidelines and principles. The compliance mechanisms they introduced have become a model for other environmental treaties. The purpose of the UNEP was to “promote international co-operation in the field of the environment and to recommend, as appropriate, policies to this end, [and] to provide general policy guidance for the direction and coordination of environmental programmes within the United Nations system.”³⁷ The programme makes particular effort to nurture partnerships with other UN bodies in the achievement of sustainable development. The establishment of UNEP secretariat by the General Assembly was “to serve as a focal point for environmental action and co-ordination within the United Nations system.”³⁸

³⁵Carol Annette Petsonk, “The Role of the United Nations Environment Programme (UNEP) in the Development of International Environmental Law” Vol. 5 American University International Law Review pg. 352 (1990).

³⁶*Ibid.* The Montreal Protocol is a protocol to the Vienna Convention for the Protection of the Ozone Layer, adopted and opened for signature Mar. 22, 1985.

³⁷*Ibid* at pg. 354.

³⁸ *Ibid* at part II, para. 1.

3.3.2 Objectives of United Nations Environment Programme

Such objectives can be summarized as under:

- To promote international cooperation in the field of the environment and recommending appropriate policies.
- To monitor the status of the global environment and gathering and disseminating environmental information.
- To catalyse environmental awareness and action to address major environmental threats among governments, the private sector and civil society.
- To facilitate the coordination of UN activities on matters concerned with the environment, and ensuring, through cooperation, liaison and participation, that their activities take environmental considerations into account.
- To develop regional programmes for environmental sustainability.
- To help, upon request, environment ministries and other environmental authorities, in particular in developing countries and countries with economies in transition, to formulate and implement environmental policies.
- To provide country-level environmental capacity building and technology support.
- To help develop international environmental law, and providing expert advice on the development and use of environmental concepts and instruments.

Building on the Vienna Convention and the Montreal Protocol, United Nation Environment Programme has prepared a framework convention on global climate change.³⁹ Under such framework, to deal with the toxic or dangerous products steps had evolved for the regulation of the same during their whole lifetime. It means that regulations should apply to production, transport, marketing and waste elimination. The regulation of production is a highly technical issue which has to be solved by applying different methods to different groups of products. Therefore, the United Nation Environment Programme has established an International Register of

³⁹ *Ibid* at pg. 356.

Potentially Toxic Chemicals containing detailed information on substances of international importance that may be consulted with those responsible for health and environmental protection in different countries.

Since its formation the United Nation Environment Programme has undertaken several environmental law programme to concentrate on broad range of global environmental problem. Apart from the Vienna Convention and Montreal Protocol, the United Nation Environment Programme has adopted various Conventions from time to time. Some of the important Conventions are: Basel Convention, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Conservation of Migratory Species (CMS), Conventions and protocols for the protection of Mediterranean Sea and Persian Gulf, the Caribbean Sea and many more.

It may be mentioned here that initially, the functions of UNEP were much more of a promotional nature than an operational one, but gradually it has achieved its operational character. In this regard, some examples of operational character may be referred to:

- a. In 1978, UNEP sought to achieve formulations of principles to guide States in respect of co-operation for sharing resources and in respect of the problems of liability and compensation for pollution and environmental damage.
- b. In 1978-79, UNEP took the initiative of proposing a world conservation strategy in regard to living resources and this was formally endorsed by the United Nations General Assembly in 1979.
- c. In the same year the UNEP was given the responsibility of administration of three environmental trust funds:
 - i. for the protection of the Mediterranean against pollution;
 - ii. for the protection and development of the marine environment and coastal areas of Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates; and

- iii. for the Convention of 1973 on International Trade in endangered species of wild fauna and flora.

One of the main achievements of United Nation Environment Programme has been the United Nations Conference on the Human Settlements, popularly known as the “Habitat Conference”, held at Vancouver on and from 31st May to 11th June, 1976.⁴⁰ Thus in this way, United Nation Environment Programme established itself as an effective machinery of the United National for facilitating the development of international environmental law by convening various Conventions, adopting resolutions and making agreement, including formulation of various environmental programmes and co-ordinating various international, national, regional activities to fulfil the commitment of the Stockholm Declaration, mainly for the development of better human environment and settlements.

3.4 Other Important Conventions prior to Nairobi Declaration

After the Stockholm Conference the most notable international Conventions that were held on different environmental issues are as follow:

- I. Convention on International Trade in Endangered species of Wild flora and fauna, 1973.** It aimed to control and prevent international trade relating to endangered species of wild flora and fauna for the purpose of reducing the economic incentive to poach endangered species and destroy their habitat by closing off the international market.
- II. Convention for prevention of pollution originating from Land-based sources (Paris), 1974.** It was adopted at Paris and signed by 14 Western European countries concerning marine environment pollution originating from land other than dumping and was applied to North Atlantic Ocean.
- III. Convention for the protection of Marine Environment of Baltic Sea Area, Helsinki, 1974.** The Convention represented by seven Baltic States agreed to take all appropriate measures, legislative as well as

⁴⁰ J. G. Starke, *Introduction to International Law* pg. 413 (Aditya Books Pvt. Ltd., New Delhi, 10th Edn., 1994).

administrative to prevent and abate pollution and to protect and enhance the marine environment of the Baltic Sea area.

IV. Convention on Long-Range Transboundary Air Pollution, 1979 is intended to protect the human environment against air pollution and to gradually reduce and prevent air pollution, including long-range transboundary air pollution. It is implemented by the European Monitoring and Evaluation Programme. Since its inception the convention addressed some of the major environmental issues through scientific collaboration and policy negotiation. It consisted of eight protocols for the purpose of identifying specific measure to be taken by parties for reducing emissions that causes air pollutions.

V. Convention Concerning Occupational Safety and Health and the Working Environment had convened at Geneva on 3rd June, 1981 by the General Conference of the International Labour Organisation. In this Convention, it was proposed that with regard to the safety, health and the working environment, it has become imperative that in the light of national conditions and practice and in consultation with the representative organization each member shall implement and periodically review a coherent national policy in this regard.

3.5 Nairobi Declaration, 1982

In the Nairobi Declaration, the "world community of states ... solemnly requests Governments and people to build on the progress so far achieved, but expresses its serious concern about the present state of the environment worldwide, and recognises the urgent necessity of intensifying the efforts at the global, regional and national levels to protect and improve it."⁴¹

Ten years after Stockholm, UNEP convened a special session of its Governing Council from 10 to 18 May 1982 to commemorate the Conference's tenth anniversary. In the special session discussion was held and emphasis was put on the validity of the principles agreed at Stockholm, the shortcomings in the

⁴¹ Paolo Galizzi, "From Stockholm to New York, via Rio and Johannesburg: Has the Environment Lost its Way on the Global Agenda?" Vol. 29 Fordham International Law Journal pg. 968 (2005).

implementation of the Stockholm agenda, and the failure to seriously tackle environmental degradation. The Governing Council adopted the Nairobi Declaration, urgently calling for the adoption of renewed international efforts and measures. The creation of a special commission to frame long term environment strategies for the purpose of achieving sustainable developments upto 2000 and beyond was the main motto under the Nairobi Declaration.

Regarding the question of validity of the different principles that was agreed in Stockholm agenda in the Nairobi Declaration, the “world community of states” reasserted that “the principles of the Stockholm Declaration are as valid today as they were in 1972.”⁴² The Declaration noted that the Stockholm Action Plan had, regrettably, only been partially implemented “the results cannot be considered as satisfactory...[it] has not had sufficient impact on the international community as a whole.”⁴³

The Nairobi Declaration urged “all Governments and people of the world to discharge their historical responsibility, collectively and individually, to ensure that our small planet is passed over to future generations in a condition which guarantees a life of human dignity for all.”⁴⁴ The declaration emphasises on the necessities to promote the progressive development of international environmental law by the world States alongwith the need for environmental management and assessment. On various aspects such as development of new technical innovation in promoting resource substitution, recycling and conservation due to emergence of new environmental problems, like deforestation, soil and water degradation, desertification, changes in the ozone layer, increasing concentration of carbon-dioxide, acid rain, extinctions of various animal and plant species also the declaration put emphasis.

The Nairobi Declaration has helped to identify the prevailing deficiencies in international environmental law during post Stockholm period and proposal for more stringent and just international rules, regulations and guidelines to combat newly emergent environmental problems. The Declaration was further supplemented by the

⁴² *Ibid.*

⁴³ *Ibid.*

⁴⁴ *Ibid* at pg. 10.

elaborate World Charter for Nature (on Conservation of Nature) adopted by the UN General Assembly in a resolution of 20th October, 1982.⁴⁵

3.6 Vienna convention for the protection of ozone layer, 1985

In 1981, UNEP acted on a proposal to develop a global convention on the ozone layer with a view to lay down framework for the international efforts to protect the ozone layer. It was adopted in 1985 and entered into force on 22 Sep 1988. The ozone layer is important in keeping out harmful ultraviolet radiation from the sun. The object of the Convention was to promote cooperation by the parties to it by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer. It envisages the taking of appropriate measure to protect human health and environment against adverse effects resulting from human activities that modify or are likely to modify the ozone layer.

3.7 Montreal protocol on substances that deplete ozone layer, 1987

As the Vienna Convention did not include legally binding reduction goals, it gave rise to the need of such kind and the culmination is the accompanying Montreal Protocol on Substances that Deplete the Ozone Layer. The most significant commitments in the protocol are the schedules for phasing out ozone depleting substances. He protocol requires all the parties to eliminate the production and import of nearly hundred substances that deplete the ozone layer as per agreed timelines. It also provided for a multilateral fund which a financial mechanism to help qualifying developing countries to phase out their consumption of ozone depleting substance.

3.8 Basel convention on the transboundary movement of hazardous wastes, 1989

The next important Convention under the international environmental law was the Convention concerning the control of transboundary movements of hazardous wastes and their disposal. The Convention was regarding the risk of damage to human health and the environment due to disposal of hazardous and other wastes and their

⁴⁵ J. G. Starke, *Introduction to International Law* pg. 415 (Aditya Books Pvt. Ltd., New Delhi, 10th Edn., 1994).

transboundary movement causing threat to human health. The Convention was adopted on March 22, 1989 by the Conference of Plenipotentiaries in Basel, Switzerland. Such step was taken in response to a public outcry due to the discovery in Africa and other parts of the developing world for depositing of toxic wastes imported from abroad. In addition to this, the rapid worldwide industrial growth leading to detection of traces of toxic chemicals in drinking water supplies, aerated drinks, groundwater sources, and in food and vegetables has focused the attention of the public worldwide on the risks posed by the inappropriate disposal of hazardous waste and accidental release of toxic chemicals into the environment. The growing quantum of wastes and more so the change in the composition of the wastes with industrial processes becoming more complex and the wastes the industry is spewing out are becoming more hazardous, toxic, and dangerous. Therefore, a need was felt to have an international law regulating such transboundary movement of hazardous wastes. This set the stage for the Convention (Basel Convention)⁴⁶, which is intended to establish a global regime for the control of international trade in hazardous and other wastes. The Basel Convention had come into force in 1992 and as of February 2014, 180 States and the European Union are parties to the Convention.⁴⁷

3.8.1 Aims and Objectives

By conferring the duty on the State parties the Convention prohibit the export of hazardous wastes and also envisage taking appropriate measures to reduce the generation of hazardous wastes and other wastes to the minimum. It also aims in ensuring that hazardous wastes should be treated and disposed of as close as possible to their source of generation and also to minimise the waste generation at source.

The definition of 'Hazardous Wastes' by including toxic, poisonous, explosive, corrosive, flammable, ecotoxic, and infectious substances has made it

⁴⁶ *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes*, Council on Foreign Relations, (2010) Available at: http://www.cfr.org/publication/20588/basel_convention_on_the_control_of_transboundary_movements_of_hazardous_wastes.html (Last visited on Aug. 20, 2015).

⁴⁷ Kurukulasuriya Lal and A. Nicholas, *Training Manual on International Environmental Law* pg. 127, United Nation Environment Programme, (Earth Print Publication, 1st Edn., 2006).

wide.⁴⁸ The definition has to be read with Annexures I to III which spell out the various categories of wastes. Apart from taking into ambit those wastes which are declared hazardous by domestic laws⁴⁹, it also includes clinical wastes, asbestos, and PCB contaminated materials, etc. The other wastes included in the Convention are household wastes and solid waste incinerator ash.

The Basel Convention forbids the export of any hazardous or other waste until the importing and transit nations have provided written authorisation.⁵⁰ As part of that authorisation, the importing nation must confirm the existence of a contract between the “exporter and the disposer specifying environmentally sound management of the wastes in question.” To receive such authorisation, an exporter must provide written notification to the designated “competent authority”⁵¹ of the importing nation and of any other nation through which the waste will be transported.⁵² The notification must include specified information about such things as the nature and amount of the waste, the waste generator, and the ultimate disposal.⁵³ The export may not commence until the transit and importing countries agree in writing to the export.⁵⁴ In addition to approving the request, the transit and importing countries are authorised to deny permission, request additional information, or approve subject to specified conditions. Although a transit country is to respond within sixty days, a time deadline is inapplicable to the importing nation's response.⁵⁵ The Basel Convention specifies that no country shall export to a country which has prohibited imports of particular

⁴⁸Article 1 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁴⁹Article 2 (1) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵⁰Article 6 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵¹Para 3 (b) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵¹Article 5 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989 providing for each nation to identify a "competent authority," along with the "focal point" to act as the contact point for all matters, filings, and requests related to the export of hazardous waste.

⁵²Article 6 para 1 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵³Article 6 providing that an exporter is to provide the information identified on Annex V(A)). Annex V(A) contains twenty-one separate items. *Id.* at Annex V(A).

⁵⁴Para 3 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵⁵Article 6, para. 4, 3(b) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

wastes.⁵⁶ Signatories of the Convention are also precluded from exporting to non-signatories⁵⁷ however, may occur if a bilateral agreement permits such export.⁵⁸ In such cases, the agreements are to conform to sound waste management principles.

3.8.2 Obligations of the Parties

As already mentioned above, the Convention sets forth the general obligations requiring parties to ensure that transboundary movement of wastes is reduced to the minimum. Consistent with environmentally sound and efficient management, it reflects an approach that wastes should, as far as possible, be disposed of in the state where they were generated.⁵⁹ The parties must not allow exports to parties which have prohibited by legislation all imports, or where they have reason to believe that the wastes will not be managed in an environmentally sound manner, and are obliged to co-operate to improve and achieve environmentally sound management of such wastes.⁶⁰ Parties may prohibit the import of such wastes and must consent in writing to any specific imports which they have not prohibited.⁶¹ The Convention also requires parties to provide information about a proposed transboundary movement of hazardous wastes and other wastes to the states concerned and also clearly state the effects of the proposed movement on human health and environment.⁶² The parties must prevent the imports of such wastes if they have reason to believe that they will not be managed in an environmentally sound manner.⁶³ In order to encourage states to become parties to the Convention, wastes may not be exported to or imported from a non-party and they cannot be exported for disposal to the Antarctic area.⁶⁴ The

⁵⁶ Article 4 para 1(b) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵⁷ Article 7 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵⁸ Article 11 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁵⁹ Article 4 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶⁰ Article 4 (2) (d) and (e), 4 (8) and 11 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶¹ Article 4 (1) (a) and (c) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶² Article 4 (2) (f) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶³ Article 4(2) (g) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶⁴ Article 4 (5) and (6) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

Convention considers such traffic illegal which contravenes notification or consent requirements, or fails to conform to the documents, or results in deliberate disposal in contravention of the Convention and general principles of international law. Such illegal traffic in hazardous wastes or other wastes is criminal.⁶⁵

The Convention also requires that parties should allow transboundary movement of wastes only if the exporting country does not have the technical capacity, facility, or suitable disposal sites or the wastes in question are required as a raw material for recycling or recovery industries in the state of import or in accordance with other criteria decided by the parties.⁶⁶ The transport and disposal of hazardous and other wastes may only be carried out by authorised persons; transboundary movements must conform to generally accepted and recognized international rules and standards of packaging, labeling, and transport, take account of relevant internationally recognized practices, and be accompanied by a movement document until disposal.⁶⁷ The Convention makes sure that the exporting parties do not transfer their obligation of environmentally sound management of wastes to the importing country.⁶⁸ The Convention also makes it mandatory for the parties to designate or establish one or more competent authorities and one focal point.⁶⁹

3.8.3 Cooperation between the parties

The Basel Convention also provides for cooperation between parties, ranging from exchange of information on issues relevant to the implementation of the Convention to technical assistance, particularly to developing countries⁷⁰. The Secretariat is required to facilitate and support this cooperation, acting as a clearing-house.⁷¹ In the event of a transboundary movement of hazardous wastes having been

⁶⁵Article 4 (3) and 9 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶⁶Article 4 (9) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶⁷Article 4 (7) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶⁸Article 4 (10) and (11) of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁶⁹Article 5 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁷⁰Articles 10 and 13 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁷¹Article 16 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

carried out illegally, i.e. in contravention of the provisions of articles 6 and 7, or cannot be completed as foreseen, the Convention attributes responsibility to one or more of the States involved, and imposes the duty to ensure safe disposal, either by re-import into the State of generation or otherwise.⁷²

3.9 The United Nations Conference on Environment and Development (UNCED), The Rio Declaration

UNCED emerged from the Brundtland Report. The UN General Assembly resolution accepting the Report⁷³ and showing deep concern by the continuing deterioration of the environment, serious degradation of the global life-support systems due to global ecological imbalance that lead to an ecological catastrophe and also recognising that decisive, urgent and global action is vital to protect the ecological balance of the Earth, convened a world conference on environment and development for two weeks (June 3-14, 1992) in Rio de Janeiro, Brazil. It is also known as Rio Conference or Earth Summit. It was attended by delegates from 176 States, including 103 Heads of State or Government⁷⁴ with different views and objectives. The developed world, in particular, wanted the Summit to re-energise the international community's environmental agenda, while the developing world wanted to put development and economic growth on the center stage. Therefore, the Summit was an attempt reflecting a compromise and a new consensus between developed and developing countries.

Two important documents namely the Rio Declaration on Environment and Development and Agenda 21 the official documents from UNCED have since then taken the central role in shaping the idea of environment and development, most importantly the sustainable development. Whereas the Rio Declaration provided a vision of sustainable development, Agenda 21 provided a comprehensive plan of action that was created to guide and coordinate the work of the UN, governments, and

⁷²Articles 8 and 9 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, 1989.

⁷³G.A. Res. 44/228, Dec. 22, 1989, cited in Peter P. Rogers, Kazi F. Jalal, *et. al.*, *An Introduction to Sustainable Development*, (Earth Scan, 1st Edn., 2008)

⁷⁴Peter H. Sand, "International Environmental Law after Rio", *Kaleidoscope*, Vol. 4 EJIL pg. 378 (1993).

other major groups in their efforts to transition society towards sustainable development⁷⁵.

3.9.1 The Rio Declaration

Having met at Rio to reaffirm the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16th June, 1972 and seeking to build upon it, with the goal of establishing a new and equitable global partnership through the creation of new levels of co-operation among States and to protect the integrity of the global environment and system of development, Rio Declaration framed 27 principles touching eight most important areas which are:

1. Right to environment;
2. Transboundary pollution;
3. Intergenerational equity;
4. Environmental impact assessment;
5. Precautionary approaches;
6. Cooperation, exchange of information, notification and prior consultation;
7. Trade and the Polluter Pays Principles; and
8. Public participation in environmental decision making.

A brief overview of the abovementioned areas have been made under the following heads.

3.9.2 The Right to Environment and Sustainable development

Under Principle 1 it has been proclaimed that human beings are at the center of concerns for sustainable development.⁷⁶ They are entitled to a healthy and

⁷⁵ H. Gudmundsson, R.P. Hall, *et al.*, *Sustainable Transportation* pg. 23 (Springer Texts in Business and Economics, 1st Edn., 2016).

⁷⁶ John Batt and David C. Short, "The Jurisprudence of the 1992 Rio Declaration on Environment and Development: A Law, Science, and Policy Explication of Certain Aspects of the United Nations Conference on Environment and Development" Vol. 8J National Resources and Environmental Law pg. 229 (1992-1993).

productive life in harmony with nature. Principles 3 and 4, read together, represent the core compromise reached at Rio between environmental concern and development. Principle 3 affirms that “The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations,”⁷⁷ while Principle 4 reiterates that “In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.”⁷⁸

3.9.3 The Legal Principles

The Rio Declaration includes several legal principles. For example, Principle 2 concerning the effect of transboundary activities, reproduces almost verbatim Principle 21 of the Stockholm Declaration, with a minor addition: Principle 2 adds two words, “and developmental,” to the original Stockholm formulation of the principle recognising States’ sovereignty over their natural resources and the obligation not to cause environmental damage. Other more controversial legal principles are also included in the Rio Declaration: “the precautionary principle;⁷⁹ the principle of common but differentiated responsibility;⁸⁰ environmental impact assessment;⁸¹ the polluter pays principle;⁸² and the principle of public participation.”⁸³

⁷⁷ Rio Declaration on Environment and Development, principle 1, U.N. Doc. A/CONF.151/5/Rev.1

⁷⁸ Principle 4 of the Rio Declaration on Environment and Development.

⁷⁹ Principle 5 of the Rio Declaration on Environment and Development-“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

⁸⁰ Principle 7 of the Rio Declaration on Environment and Development-“States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.”

⁸¹ Principle 17 of the Rio Declaration on Environment and Development-“Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.”

⁸² Principle 16 of the Rio Declaration on Environment and Development-“National authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.”

⁸³ Principle 10 of the Rio Declaration on Environment and Development-“Environmental issues are best handled with participation of all concerned citizens at the relevant level. At the national level, each

3.9.4 The Policy Guidelines

Other principles are more in the nature of policy guidelines, although the line between law and policy is not always clear. The Rio Declaration envisages three groups of policy provisions.

1. The first group expresses concern for development. According to Principle 5 that all States and all people shall co-operate in the essential tasks of eradicating poverty, as an indispensable requirement for sustainable development in order to reduce the disparities in standard of living and to meet the needs of the majority of the people all over the world. Principle 6 states that international actions in the field of environment and development should also address the interest and needs of all countries, specially, of those who are environmentally vulnerable. Principle 9 relates to the strengthening of endogenous capacity-building for sustainable development by improving scientific understanding.
2. A second group of principles addresses the world economic order. In connection with the same Principle 7 proclaims that States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. According to Principle 8, to achieve sustainable development and higher quality of life for all people, State should reduce and eliminate unsustainable pattern of production and consumption. In addition, States shall also co-operate to strengthen indigenous capacity building for sustainable development by improving scientific and technological knowledge and by enhancing the development, adaptations, diffusions and transfer of technologies under Principle 9 of the Declaration. Economic aspects are treated in Principle 12 which

individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.”

advocates a “supportive and open economic system” and international consensus and condemns discriminatory trade measures or disguised restrictions on international trade, as well as unilateral actions. Finally Principle 14 aims to discourage or prevent the relocation and transfer to other states of activities and substances that cause severe environmental degradation or are harmful to human health.

3. A last group of principles was relating to public participation. Principle 10 recognises for individuals rights to information, to participation and to remedies in environmental matters. Principles 20 to 22 stress the importance of the participation of women, youth and indigenous peoples, but the terms used show that these provisions are more guidelines than legal norms.

3.10 Agenda 21

It is the action plan implemented worldwide to cover a complete list of items such as poverty, consumption patterns, demography, human health and settlement, and more conventional environmental issues such as protecting the atmosphere, forests and fragile ecosystems, seas, freshwaters and biodiversity . It also provides a comprehensive blueprint as to how the world’s nations can work individually, collectively towards sustainable development; Agenda 21 envisages steps to be taken globally, nationally and locally by the organisation of the United Nations, the governments, and the major groups. It is so named because of its position in the meeting agenda. It consisted of some forty separate sections of concerns and outlines a total of over 2,500 recommendations.

3.10.1 Aims and Objectives

Agenda 21 emphasises on the following major aims:

1. Reducing the amount of energy and raw materials society consumes and the pollution and waste it produces;
2. Protecting fragile ecosystems and environments;

3. Stress upon fairer distribution of wealth including the needs of poor and disadvantages people; and
4. Identifies program areas and specifies actions, objectives, activities, and means of implementation to concretely promote sustainable development.⁸⁴

3.10.2 The Sections

Agenda 21 is divided into four sections:

1. social and economic dimensions (section I);⁸⁵
2. conservation and management of resources for development (section II);⁸⁶
3. strengthening the role of major groups (section III);⁸⁷ and
4. of implementation (section IV).⁸⁸

The issues such as international cooperation to accelerate sustainable development in developing countries and related domestic policies; combating poverty; changing consumption patterns; protecting and promoting human health; promoting sustainable human settlement development; integrating environment and development in decision making etc. have been covered under Section I consisting of seven chapters (Chapter 2-8).

Section II containing of Chapters 9-22 deals with issues such as protection of the atmosphere, integrated approach to the planning and management of land resources, combating deforestation, combating desertification and drought, sustainable mountain development, promoting sustainable agriculture and rural development, conservation of biological diversity, environmental sound management of biotechnology, toxic chemicals, radioactive wastes, and hazardous waste etc. are important among others which deserve special mention.

Section III focuses on strengthening the role of nine major groups in all aspects of Agenda 21 such as women; youth; indigenous peoples; non-governmental

⁸⁴ Preamble 1.6 to Agenda 21.

⁸⁵ Chapter 2-8.

⁸⁶ Chapter 9-22.

⁸⁷ Chapter 23-32.

⁸⁸ Chapter 33-40.

organisations; local authorities; trade unions; business and industry; the scientific and technological community; and farmers (Chapters 23-32).

Containing eight chapters (Chapters 33-40) Section IV of Agenda 21 deals with the means of implementation such as financial resources and mechanisms; transfer of environmentally sound technology cooperation and capacity building; science for sustainable development; promoting education, public awareness and training; national and international legal instruments and mechanisms; etc.

The chapter on international legal instruments has implications for international law in general because it designates specific means that should be used to develop international environmental law, both in substance and in procedure. It insists on particular norms such as the legal aspects of sustainable development and on the adoption of environmental standards. It calls for the integration of environment and development policies in international treaties and emphasises the participation in and the contribution of all countries to the further elaboration of international environmental law in the context of sustainable development. It refers to the relationship between existing national instruments and relevant social and economic agreements and call for improvement in the efficacy of international environmental law, in particular by procedures and mechanisms to promote and review the implementation of treaties, such as efficient and practical reporting systems.

Agenda 21 pays particular attention to national legislation. It makes frequent reference to national laws, measures, plans, programmes and standards. Chapter 8, Integrating Environment and Development in Decision-Making, advocates the use of legal and economic instruments for planning and management, seeking incorporation of efficiency criteria in decisions. It recognises the importance of laws and regulations suited to country-specific conditions for transforming environment and development policies into action, adding that not only command-and-control methods should be used, but also a normative framework for economic planning and market instruments. Such methods can also be useful for the implementation of obligations resulting from international treaties. Governments should regularly assess the laws and regulations enacted and the related institutional or administrative machinery with a view to rendering them effective; integrated strategies should be developed to maximise

compliance with law and regulations relating to sustainable development. Finally, Governments and legislators.....should establish judicial and administrative procedures for legal redress and remedy of actions affecting environment and development that may be unlawful or infringe on rights under the law and should provide access to individuals, groups and organisation with a recognised legal interest.

The Rio Conference is largely⁸⁹ considered a success.⁹⁰ Environment and development played an equal role, reflecting a fair compromise consensus between developed and developing countries' needs and priorities. The international sustainable development agenda recognized that development and the environment were inextricably connected and mutually supportive. Environmental measures had to go hand in hand with development and poverty eradication efforts. By the same token, development had to be sustainable and fully integrate environmental considerations. Agenda 21, an ambitious and concrete plan of action, identified measures to deal effectively with the most pressing environmental problems of modern times and to promote sustainable development. Legally binding treaties addressed two major global environmental issues: climate change and biodiversity.

In sum, the Rio documents join environmental protection and economic development in the concept of sustainable development. All components of society are called to participate towards the achievement of this goal. Although at first some contested the importance of the Rio Conference legal texts, the two Conventions and the Declaration represent milestones in international environmental law. Several principles of the Declaration, such as public participation, the prior assessment of environmental impacts, precaution, notification of emergencies and prior information and consultation on projects potentially affecting the environment of other states, have been included in numerous binding and non-binding international instruments since Rio and constitute emerging customary law rules.

⁸⁹ Marc Pallemarts, "International Environmental Law in the Age of Sustainable Development: A Critical Assessment of the UNCED Process" Vol. 15 *Journal of Law and Commerce* pg. 623 (1996).

⁹⁰ Raneie Khooshie Lal Panjabi, "From Stockholm to Rio: A Comparison of the Declaratory Principles of International Environmental Law" Vol. 21 *Denver Journal of International Law and Policy* pgs. 275-276 (1993).

3.11 Convention on Bio-Diversity

The Convention on Biological Diversity (CBD) was inspired by the world community's growing commitment to sustainable development the seed of which can be found in the Agenda 21. Even prior to the Agenda 21 the negotiations for the Convention on Biological Diversity took place for the first time in the Governing Council decision of the UNEP by convening an Ad Hoc Working Group of Experts for the same. It was adopted on May 22, 1992 and entered into force on December 29, 1993 consisting of 188 parties. The preamble of the Convention is premised upon "the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components . . . (and) also of the importance of biological diversity for evolution and for maintaining life sustaining systems in the biosphere."⁹¹ The CBD further affirms "that the conservation of biological diversity is a common concern of humankind."⁹² The Convention is also concerned that biological diversity is being significantly reduced by certain human activities, there is a need to conserve and sustainable use biological diversity for the benefit of present and future generations. The fact that biological diversity is unevenly distributed around the world is also the focus point in the Convention.

3.11.1 Objectives

Article 1 set out the broad objectives of the Conventions which are as follows:

1. The conservation of biodiversity (Articles 6-9);
2. The sustainable use of its components (Articles 6, 10 and 14); and
3. The fair and equitable sharing of benefits arising from the use of genetic resources (Articles 15, 19, 20 and 21).

⁹¹ Convention on Biological Diversity, United Nations pg. 1 (1992), *Available at*: <https://www.cbd.int/doc/legal/cbd-en.pdf> (Last visited on Sept. 13, 2015).

⁹² *Ibid.*

Article 1 made an attempt to ensure that balance decisions can be reached if divergent interpretations and conflicts of interest arise and the ways to settle such conflicts.

Based on these broad objectives the Convention can be considered as an important landmark from several points of view. It is for the first time that biological diversity has been dealt with along with the commitment that the conservation of biodiversity is the common concern of humankind. It demonstrates the will to focus on all aspects of biodiversity. It also prescribed a mechanism for the creation of funds to be provided to developing countries to help them implement the Convention. The term “biodiversity” has been defined in Article 2 as “Biological diversity” means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

It covers a wide spectrum of issues, ranging from protected areas and traditional knowledge on biodiversity, to incentives for the sustainable use of natural resources and the transfer of biotechnology. Thus, conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits, together form the heart or basic agreement of the Convention. The central concept of “sustainable use,” which also governs much of the U.S. public land system, is defined under the CBD as “the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.”⁹³ The CBD seeks to have parties integrate conservation and sustainable use into its decision-making, to avoid and minimize adverse impacts to biological diversity, and utilize customary and local efforts as appropriate.⁹⁴

3.11.2 The Genetic Resources

The Convention, for the first time included the genetic diversity and issues relating to the same such as access and use of genetic resources, technology transfer

⁹³ Article 2 of the Convention on Biological Diversity.

⁹⁴ Article 10 of the Convention on Biological Diversity.

and biosafety etc. Genetic resources are defined as “material of plant, animal, microbial, or other origin that contains units of heredity.”⁹⁵ Genetic material includes seeds, cuttings, individual organisms or sperm. Under Article 15 provisions have been made to maintain a balance of vast genetic resources of developing countries against the enormous economic resources of developed countries by regulating access to genetic resources. It also addressed the developed countries to compensate of developing countries for the utilization of their resources. In the Convention the Conference of the Parties (COP) put stress on the importance of national legislation or agreements among parties to regulate the transfer the genetic resources.

3.12 Recent Developments

The adoption of Basel Convention in 1989 which served as an instrument to legitimise hazardous waste trade rather than to prohibit the same necessitated the amendment of the same. The condemnation which was made by the African countries, some developing countries and Greenpeace led to the amendment of the Basel Convention, 1994 which finally came up with a unique coalition including some Eastern and Western Europe managed to pass by consensus what has come to be known as Basel Ban.

3.12.1 Basel Ban Amendment

Since the adoption of the Basel Convention, the majority of the State parties continue negotiations on the introduction of a total or partial ban on transboundary movements of hazardous wastes under the framework of the third Conference of Parties (COP). Unfortunately, due to the refusal to accept a suggestion by most of the developing countries it could not be materialised. But due to the constant effort of the Contracting Parties of the Basel Convention to fulfill the promise for the full ban on the exports of hazardous wastes from OECD countries to non-OECD countries, the overarching priority of the Conventions work has resulted in the significant accomplishment through the Basel Ban Amendment in 1995. The Ban Amendment provides for the prohibition of exports of all hazardous wastes covered by the Convention that are intended for final disposal, reuse, recycling and recovery from

⁹⁵ Article 2 of the Convention on Biological Diversity.

countries listed in annex VII to the Convention to all other countries. The list of Parties which have not ratified the Ban includes major producers of hazardous waste such as the US and Japan as well as developing countries such as India and Pakistan who are major importers of hazardous waste. The issue of the non-ratification of the Ban has become 'emotional and over politicised' to the extent that it is doubtful that it will ever be resolved.⁹⁶

Still the Basel Ban is considered as vital for two primary reasons:

1. To prevent damage to the environment and human health caused by the disproportionate export and disposal of hazardous wastes to countries that did not create them and where there was less infrastructure and resources to mitigate the great risks associated with such wastes.
2. To prevent waste generators from avoiding taking responsibility to minimise the generation of hazardous wastes through clean production technologies and methods, by externalisation of their costs to countries where disposal is less costly than at home.

3.12.2 Basel Protocol

The Basel Protocol on Liability and Compensation for Damage resulting from Transboundary Movements of Hazardous Wastes and their Disposal⁹⁷ was adopted in 1999. It was in 1992 when the Basel Convention entered into force, the COP had thought of adopting a mechanism to assign liability and provide compensation for any damages resulting from such activities and after more than six years of negotiations the COP endorsed the Protocol on Liability and Compensation on December 10, 1999. As is the case of the majority of treaties on civil liability for environmental damage adopted over the past two decades, it has not yet entered into force. Guidelines for two types of liability such as strict and fault-based have been provided under Articles 4 and 5 of the Protocol.

⁹⁶ E. Rachmawaty and F. Perrez, "Presentation of the Context and the Concept of the CLI (Presentation made at the First Meeting of the Indonesian-Swiss Country-led Initiative on an informal process to improve the effectiveness of the Basel Convention, Bali)", (June 15-17, 2009) Available at: [www.basel.int/convention/cli/balimeeting/Bali_Presentation%201%20%20Intro%20CLI%20\(Expanded%20Bureau\)7918.ppt](http://www.basel.int/convention/cli/balimeeting/Bali_Presentation%201%20%20Intro%20CLI%20(Expanded%20Bureau)7918.ppt). (Last visited on Sept. 16, 2015).

⁹⁷ Hereinafter referred to as "the Basel Protocol."

Article 4 provided the concept of strict liability that is applicable in two situations:

1. When both the importing and exporting nations are Parties, the Protocol imposes strict liability on the notifying entity such as the nations, waste generating company or exporting shipping company that notifies the importing nation of the pending waste shipment until the disposer takes control of the wastes; and
2. When only one of the contractors is a Party to the Convention, the Protocol applies strict liability for damages that occur while the Party possesses control of the wastes.

As per Article 5, the fault-based liability is imposed for failure to comply with the Basel Provisions or wrongful intentional, reckless or negligent acts or omissions.

The Protocol under Article 14 requires notifiers, exporters and importers to carry insurance, bonds or other financial guarantee to cover the liability. Each phase of a transboundary movement, from the point at which the wastes are loaded to their export, international transit, import and final disposal has been covered under the insurance.

3.12.3 The Stockholm Convention on Persistent Organic Pollutants (POPs)

The Stockholm Convention on Persistent Organic Pollutants was adopted at a Conference of Plenipotentiaries on 22 May 2001 in Stockholm, Sweden. The Convention entered into force on 17 May 2004, ninety (90) days after submission of the fiftieth instrument of ratification, acceptance, approval or accession in respect of the Convention. As of December 2010 the Convention had 172 Parties.⁹⁸

Persistent Organic Pollutants (POPs) are chemicals that are highly toxic, persistent and bioaccumulate in the environment. The Stockholm Convention establishes a strong international framework for promoting global action on POPs available in fatty tissue in the food chain and is prone to moving long distances once

⁹⁸ Draft Revised Guidance on the Global Monitoring Plan for Persistent Organic Pollutants, UNEP, 2011, Available at: http://www.pops-gmp.org/res/file/UNEP-POPS-COP_5-INF-27.pdf

released into the environment.⁹⁹ Exposure to POPs can lead to serious human health effects including certain cancers and reproductive disorders, damage to the nervous and immune systems and adverse impacts to normal infant and child development. POPs can also be transported across international boundaries far from their sources, even to regions where they have never been either used or produced. Extensive scientific studies have shown that POPs are some of the most dangerous and data proves that POPs can damage endocrine systems and can result in reproductive disorders, birth defects, and immune-system deficiencies.¹⁰⁰ Article I of the Stockholm Convention on persistent organic pollutants states that the Convention was developed “to protect human health and the environment from persistent organic pollutants (POPs).”¹⁰¹ The Stockholm Convention creates a legal regime to phase out or eliminate twelve pollutants, including aldrin, chlordane, DDT, polychlorinated biphenyls (PCBs), and hexachlorobenzene (HCBs). Ten of these are intentionally produced.¹⁰²

Chemicals that are controlled by the Convention are listed in one or more of three annexes to the Convention: Annexes A (elimination), B (restriction) and C (unintentional production). Annex A is a list of nine intentionally produced POPs that are subject to elimination. Seven of these have been produced for use as pesticides. They are: aldrin, chlordane, dieldrin, endrin, heptachlor, mirex and toxaphene. Two of these have been produced primarily for use as industrial chemicals. They are hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs). Under Annex B, Parties must take measures to restrict the production and use of the chemicals listed under Annex B in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex. Specific exemption with respect to DDT has been provided to India for its use under acceptable purposes. For Annex C chemicals, Parties must take measures to reduce the unintentional releases of chemicals listed

⁹⁹ Peter L. Lallas, “The Stockholm Convention on Persistent Organic Pollutants” Vol. 95 American Journal of International Law pg. 692 (2001).

¹⁰⁰ World Resource Institute (WRI) and Others, World Resources, 1998-99 reported that studies on persons living in the Great Lakes area indicate that exposure to POPs while in the womb and through breast milk can cause deficits in growth, neurological anomalies, and reduced short-term memories in small children at 55.

¹⁰¹ Stockholm Convention on Persistent Organic Pollutants, May 22, 2001, 40I.L.M. 532 (2001)

¹⁰² Annexes A-B of the Stockholm Convention on Persistent Organic Pollutants-providing a list of chemicals to be reduced, eliminated, or restricted with indications of whether the chemical is intentionally produced or merely used.

under Annex C with the goal of continuing minimization and, where feasible, ultimate elimination. In 2009, list of these 12 chemicals was extended to include 9 more chemicals; in April 2011, Endosulfan was added to the group of POPs. Thus, the jurisdiction of the Stockholm Convention now covers 22 substances that have properties and characteristic of POPs. Some of the candidate POPs, such as, Hexabromocyclododecane, Short-chained chlorinated paraffins, Chlorinated naphthalenes, Hexachlorobutadiene, and Pentachlorophenol are currently under review for their inclusion in various Annexes of the Convention.¹⁰³

The Convention also provides for the development of action plans at the regional or sub-regional level to identify, characterise, and address the release of the unwanted products.¹⁰⁴ These include evaluation of releases, strategies to meet the obligations, and a schedule for implementation. Taking into account the Annex's guidance on prevention and release reduction measures, as well as guidelines to be developed by the Conference of Parties, the Convention encourages the promotion and development of substitute or modified materials, products and processes that prevent the formation and release of substances in Annex C.¹⁰⁵ It also establishes the processes and criteria for adding new POPs for regulation.¹⁰⁶ Further, the Convention provides for funding and technical assistance to build capacity for its implementation by developing countries.¹⁰⁷

Among different types of POPs, dioxins, furans and co-planar PCBs are toxic substances produced as by-products of various industrial processes, including the combustion of wastes containing polyvinyl chloride (e.g., some plastics, some blood bags and fluid bags). This happens particularly when wastes are incinerated at temperatures lower than 800 degrees celsius or when the wastes are not completely incinerated. Such PCBs and other toxic air pollutants may then be produced as

¹⁰³ Ashwani Sharma, "Stockholm Convention on persistent organic pollutants: Challenges towards its implementation in India" Vol. 3(4) International Journal of Research in Environmental Science and Technology pgs. 117-121 (2013).

¹⁰⁴ Article 5(a), Annex C of the Stockholm Convention on Persistent Organic Pollutants - indicating that parties to the Stockholm Convention have two years to implement an action plan to reduce releases from anthropogenic sources of all chemicals listed in Annex C.

¹⁰⁵ Article 5(c), of the Stockholm Convention on Persistent Organic Pollutants.

¹⁰⁶ Article 8, Annex D, of the Stockholm Convention on Persistent Organic Pollutants-specifying that, based on the information noted in Annex D of the Stockholm Convention, a country nominates a new substance for review by the POPs Review Committee, which then determines whether a proposed substance meets the criteria for persistence, bioaccumulation and the potential for long-range transport.

¹⁰⁷ Articles 12-13, of the Stockholm Convention on Persistent Organic Pollutants.

emissions and/or in bottom or fly ash. In some circumstances dioxins and furan can be produced under natural conditions (e.g. volcanic activity and forests fires).

Amongst the different dioxins and furans, not all have the same toxicity; some are even harmless. They are persistent substances that do not readily break down in the environment and that bio-accumulate in the food chain. Most human exposure to dioxins, furans and co-planar PCBs is through the intake of food.

Under the Stockholm Convention, Parties are required to endeavor and develop a National Implementation Plan (NIP) to demonstrate the implementation of its obligations under the Convention. The Parties are also required to transmit its implementation plan to the Conference of Parties (COP) within two years of the date on which the Convention enters into force for it.¹⁰⁸ Article 7 sets out the requirement for production of Implementation Plans. The Implementation Plan is to explain how all of the requirements of the Convention will be implemented in each respective country. The Implementation Plan includes incorporation of two action plans, an obligatory action plan for unintentionally produced substances (Annex C substances) and a second action plan for Annex B substances (DDT) which "shall be encouraged" by the Conference of the Parties. The timetable for production of these plans is two years within entry into force of the Convention, given that they are required/proposed for implementation as part of the overarching implementation plan.

Taken as a whole, the Stockholm Convention provides a framework agreement that lays the groundwork for a basic program for the Parties to manage and control persistent organic pollutants, and, ultimately, toxic substances. Its specific requirements, taken in operational sequence, constitute the development of the major components of a complete environmental protection program. These components include the following:¹⁰⁹

- creation and maintenance of inventories of POPs sources;

¹⁰⁸ Article 20, Paragraph 1 of the Stockholm Convention on Persistent Organic Pollutants states that the Convention enters into force on the 90th day after the deposit of the 50th instrument of ratification, acceptance, approval or accession. Paragraph 2 of Article 20 adds that the Convention enters into force on the 90th day following deposit of instrument of ratification from Parties subsequently ratifying.

¹⁰⁹ *Persistent Organic Pollutants and the Stockholm Convention: A Resource Guide*, Resource Futures International for the World Bank and CIDA pg. 20 (September 2001), Available at: <http://siteresources.worldbank.org/INTPOPS/2145741115813449181/20486510/PersistentOrganicPollutantsAResourceGuide2001.pdf> (Last visited on Sept. 27, 2015).

- monitoring emissions and releases;
- tracking imports and exports of dangerous chemicals; hazard assessment;
- risk management;
- development of controls (via legislation/voluntary initiatives);
- compliance promotion, training, inspection and enforcement;
- reporting and evaluation;
- supporting research; and
- public communications, participation and education.

3.12.4 The Minamata Convention on Mercury

The Minamata Convention is an international treaty designed to protect human health and the environment from anthropogenic releases and emissions of mercury and mercury compounds. The Convention is an outcome of the initiatives undertaken by the UNEP for the global assessment of mercury and compounds including the information relating to health effects, sources, long-range transport and prevention and control technologies. Considering its serious impact on the environment the Intergovernmental Negotiating Committee of UNEP prepare a global legally binding instrument and in January 2013 the committee in its fifth session agreed on the text of the Minamata convention on Mercury. Subsequently it was adopted by the Conference of Plenipotentiaries on October 10, 2013 in Japan. It sets out the goals of phasing out of mercury added products, including mercury medical instruments by 2020.

The objective of the Convention is provided in Article 1 to protect human health and the environment from anthropogenic emissions and releases of mercury and its compounds and various other measures such as to control the supply and trade of mercury, imposition of limitations on certain specific sources of mercury and also to control mercury related products etc. to meet such objective. Under Article 4, action taken by the health sector will focus in particular on phasing out the

manufacture, import and export of mercury-containing skin lightening products and antiseptics as well as mercury sphygmomanometers and thermometers used in health care. The health sector will also be strongly involved in activities related to the exchange of information about health, public awareness-raising, research regarding health and monitoring, as reflected in Articles 17, 18 and 19 of the Convention. It also envisages provisions for emissions and releases of mercury under Articles 8 and 9 with controls directed at reducing levels of mercury. In addition to this, Articles 10 and 11 provides measures on the environmentally sound interim storage of mercury and on mercury wastes, as well as contaminated sites. With regard to financial and technical assistance Articles 13 and 14 included provisions for financial and technical support to developing countries and countries with economies in transition, and a financial mechanism for the provision of adequate, predictable and timely financial resources.

With the above measures in view it is predicted that coordinated implementation of the obligations of the Convention will lead to an overall reduction in mercury levels in the environment to protect human health and the environment from anthropogenic emissions and releases of mercury and its compounds.

3.12.5 The Paris Agreement

Adopted on December 12, 2015 by 195 Parties, the Paris Agreement provided with a legally binding framework for an internationally coordinated effort to tackle climate change. Under the framework Convention on Climate Change (UNFCCC) agreed in December on how to deal with the challenges of post-2020 climate policy. It requires all parties to develop plans on how to contribute to climate change mitigation. The agreement signals the end of the fossil fuel era as the world rapidly replaces coal, oil and gas with clean energy sources¹¹⁰. The agreement discussed and focuses on three top issues:

1. It has targeted a goal of reducing global warming below two degree centigrade to mitigate the greenhouse gases emission. To achieve the goal, the agreement

¹¹⁰ Paris COP (Conference of Parties) 21: Key Issues for the New Climate Agreement, Briefing Paper, Climate Council, *Available at*: <https://www.climatecouncil.org.au/uploads/de494149f16b3b235d8fa74fb8a9c52d.pdf> (Last visited on Mar. 21, 2017).

defines a universal, legal framework to strengthen the global response to the threat of climate change under Article 2. It has also sets out provision for meeting the goal under Article 4¹¹¹.

2. The Paris agreement incorporates a “ratchet mechanism” so these targets can continually be reviewed and strengthened. The formal review and updating of targets will be every five years starting in 2023, with a facilitative dialogue in 2018. This is critical to the integrity of the agreement and governments will have to dial up their ambition over time¹¹².
3. The agreement states that developed countries are to provide financial resources to help developing countries move away from fossil fuels and adapt to the impacts of climate change. US\$ 100 billion per year is to be provided and developed countries are urged to scale up their financial support over the next few years, with a clear plan to collectively meet the target¹¹³.

3.13 An Overview

In the context of the management of biomedical waste there is no such reference made specifically in any of the conventions or conferences held so far. Although, references of hazardous waste, radio-active waste and toxic substances, mercury etc. do find places in different Conventions and have connection with the bio-medical wastes. Prior to the Stockholm Conference no such specific Conventions had any connection with the subject, perhaps due to the fact that the pollution causes from such waste is of recent origin and the awakening steps by the world communities with regard to the same is also of recent development. In this context it is to be noted that the Conventions on radioactive substances are although for the banning of the use of nuclear weapon by the different countries, it has some connection with bio-medical waste which has been discussed in the subsequent chapter.

¹¹¹ “In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century...”

¹¹² Paris COP (Conference of Parties) 21: Key Issues for the New Climate Agreement, Briefing Paper, Climate Council, *Available at*: <https://www.climatecouncil.org.au/uploads/de494149f16b3b235d8fa74fb8a9c52d.pdf> (Last visited on Mar. 21, 2017).

¹¹³ *Ibid.*

The much awaited global Conference, the Stockholm Conference, which is considered as the milestone in the history of the protection and safeguarding the natural environment, was also silent on the subject. Although, the chapter ‘environmental management’ in the Stockholm Declaration contains most of the provisions relating to environmental pollution, both human establishments and natural resources but the provisions relating to the pollution from bio-medical waste had not specifically addressed. However, the Action Plan addresses the problem of dumping toxic or dangerous substances, elaboration of norms to limit noise, control of contaminants in food and measures for controlling pollution etc. In fact, the principles contained in the Declaration sets out provisions for the enactment of necessary laws by the Governments of all the participating nations to protect and improve the flora and fauna, non-renewable resources, wild life and human health. It has also proclaimed that defending and improving the human environment for present and future generation is an imperative goal for the mankind and it is to be pursued together with and in harmony with the established and fundamental goals of peace and worldwide economic and social development.

The Nairobi Declaration emphasises on the adoption of renewed international efforts and measures to identify the prevailing deficiencies in international environmental law during post Stockholm period and proposal for more stringent and just international rules, regulations and guidelines to combat newly emergent environmental problems but did not specified matters relating to the bio-medical waste.

However, the Basel Conventions which is on the control of transboundary movement of hazardous wastes and their disposal is particularly important for the management of the bio-medical waste. The Convention specifically addressed the clinical wastes from medical care in hospitals, medical centres and clinics and also wastes relating to pharmaceuticals, drugs and medicines. The technical guideline on the environmentally sound management of bio-medical and health care waste which was published in 2003 is an important document and a step towards the management of the same¹¹⁴. The major points of these guidelines are the practical aspects of waste

¹¹⁴ Technical guidelines on the environmentally sound management of biomedical and healthcare wastes, Secretariat of the Basel Convention, UNEP, *Available at:*

management pertaining to the handling and environmentally sound management of biomedical and health-care wastes.¹¹⁵

Likewise, the Stockholm Convention on Persistent Organic Pollutants under Article 5 and Annex C sets out different types of POPs, polychlorinated dibenzo-p-dioxins and dibenzofurans which are toxic substances produced as by-products of various industrial processes, including the combustion of wastes containing polyvinyl chloride (e.g., some plastics, some blood bags and fluid bags). These chemicals are formed and released to the environment by medical waste incinerators and other combustion processes. The Convention imposes obligations on the Governments to use best available techniques and to promote best environmental practices for new incinerators within four year after the Convention comes into force for the country¹¹⁶. The guideline on best available techniques and for best environment practices, published in 2006 by the UNEP also deals specifically with the bio-medical waste. This includes reduction, segregation, resource recovery and recycling, training and proper collection and transport of such wastes.

Similarly, in the Minamata Convention, the health sectors have been considered as an important sector which has a vital role in the implementation of different Articles of the Convention. Some of such Articles are 4,7 and 16. It lays down the obligation on such health sectors on phasing out the manufacture, import and export of mercury-containing skin lightening products and antiseptics as well as mercury sphygmomanometers and thermometers used in health care. The health sector will also be strongly involved in activities related to the exchange of information about health, public awareness-raising research regarding health and monitoring, as reflected in Articles 17, 18 and 19 of the Convention¹¹⁷.

<http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/tech-biomedical.pdf> (Last visited on Mar. 19, 2017).

¹¹⁵ *Ibid* at i.

¹¹⁶ *Ibid* at 43.

¹¹⁷ Health sector involvement in the implementation of the Minamata Convention: assessment and prevention of mercury exposure, pg. 2 Report of a Meeting, World Health Organisation, Europe, (June 24-25, 2015).

CHAPTER IV

THE QUEST FOR BIO-MEDICAL WASTE UNDER THE INDIA'S ENVIRONMENTAL REGIME SINCE ANCIENT PERIOD

The term environment is closely associated with the Sanskrit word *paryavaranam* commonly known to the people of India since ancient period, thousands of years before the advent of modern era. It has been seen from ancient history that the India's civilisation had grown up depending on the nature and this dependency had helped the people to form a nature friendly civilisation for its own selfish interest to live in an environment without harming it. The long standing culture and heritage of the country shows its concern towards preservation and protection of the nature by adopting and following various methods to maintain ecological balance. Considering the nature as the creation of God, it is now established that environment is not a physical and lifeless being but a very living and active mechanism and human beings are just one among the various other creatures that inhabit the earth¹, and the duty to safeguard it against the unwanted invasion by the human being lies on them only who are considered as most powerful species and it is them in whose hand the earth is mostly exploited in order to fulfil their desires.

Various research on the subject revealed that for the ancient Indians, the Universe was integrated whole and all natural phenomena had a divine origin.² The modern day holistic approach towards the sustainability of the nature is replicated in many Indian literatures. For example, Hindus regard everything about them as pervaded by divine presence. The rivers, mountains, lakes, animals, flora and fauna, are all manifestations of God, and therefore there is a deep respect and gratitude felt towards nature³. In fact, Indian ancient history depicted that all Indian religions are the supporter and promoter of the environment. The whole emphasis of the ancient Indian religious practices is on that human beings are the integral part of the nature and they cannot be separated from their natural surroundings. Nature has the same blessed connection with man as mother has with her child⁴. Therefore, in order to

¹Ms. U. Rajani Rao, "Environment awareness in ancient India" Vol. 2 International Journal of Life Sciences Research pg. 2 (April-June 2014).

²*Ibid.*

³Rajeev Sharma, Naveen Aggarwal, *et.al.*, "Ecological Sustainability in India through the Ages" Vol. 3(1) International Research Journal of Environment Science pg. 71 (Jan., 2014).

⁴*Ibid.*

have an elaborate understanding regarding the love and respect towards the nature, an extensive analysis has been made in this chapter under the following heads.

4.1 Protection of Environment: The Religious Perspective

The various texts on ancient environmental history showed that almost all the religions have put emphasis on the importance of environment. Apart from the Hindu religion, the other religions such as Christianity, Buddhism, Jainism, Sikhism, Islam etc. that dominated and spread over in different periods has culminated in the interdependency of nature with the living beings specially human beings and the underlying principles of all these religions have always been the same; viz., protection of environment in some way or the other. Hindu Mythology recognises omnipresence of God and believed that everything in the world bears an element of God in it and be treated accordingly. According to the ancient Indian mythology, God prevails over the whole Universe and this ancient mythology has helped Indians to maintain ‘a constant link with nature’.⁵ The concept of divine origin is based on the principle that God has created this Universe and control it with the help of divine forces. Power of God resides in different worlds in the form of different entities and governed the Universe in accordance with the ‘principle of Lila or God’s play’.⁶ In the light of above discussions let us see the contribution made by different religions towards to protection of the nature for the sake of maintaining sustainability throughout the world.

4.1.1 Christianity

The Christian religion has always been the path maker in establishing harmonious relationship between the divine and human beings vis. a. vis. the nature. Under the natural law theory, it has been seen that the church wardens always tried to establish a theological connection between the God and the nature based on reason. It was the reason that teaches the human being about the preservation and protection of the environment for self interest considering every part of the creation has His divine hand in it and no human being has an absolute right to exploit it enormously. The

⁵Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pg. 118 (Kamal Law House, Calcutta, 1st Edn., 2009).

⁶Dr. I. A. Khan, *Environmental Law* pg. 22 (Central Law Agency, Allahabad, 2nd Edn., 2002).

Biblical verses in old and new testaments provide that it is the duty of man to protect nature and Humanity must safeguard or care for the environment. Christianity prescribes a harmonious relationship between man and nature.⁷The Christian environmental ethic is based on three principles⁸:

1. the principle of creation which acknowledges that God is the creator of nature and He values it;
2. the principle of sustained order and purpose acknowledges that God sustains nature and has a purpose for it; and
3. the principle of universe corruption and redemption speaks of how mankind and nature were corrupted as a result of the fall and how God's ultimate plan is redemption is the redemption of both mankind and nature.

It contains numerous examples as to how to treat the environment. Regarding the plant life Deuteronomy's⁹ 20: 19-20 sets out ban on the cutting down of fruit trees in war to prosecute a siege. Deuteronomy (25:4 and 22:6) indicates the proper care for domestic animals and a respect for wildlife. In Isaiah 5:8-10 the Lord judges those who have misused the land. Job 38:25-28 and Psalm 104:27-30 speak of God's nurture and care for his creation¹⁰. Thus, sustaining the life of human being, animals and plant had given priority under the Bible to live in harmony with the nature.

4.1.2 Buddhism

Buddhism came into existence by the end of the Vedic period. This particular religion is based upon truth, non-violence, respect and love for the living beings including trees and plants. Simplicity and non-violence are the two cardinal principles

⁷ Rev. Anand Veeraraj, "Christianity and the Environment", cited in O.P.Dwivedi, *World Religions*, pg. 36 (Gitanjali Publishers, New Delhi, 1989).

⁸ *Rejoice Muwadzuri, Biblical Environmental Protection : Seven Keys for Christian Leaders*, A Thesis Project Submitted to Liberty Baptist Theological Seminary in partial fulfillment of the requirements for the degree, Lynchburg, Virginia, pg. 29 (March, 2014), Available at : <http://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=1888&context=doctoral> (Last visited on March 25, 2017).

⁹The fifth book of the Bible, containing a recapitulation of the Ten Commandments and much of the Mosaic law.

¹⁰Mrs. Nandita Verma, "Religion: A Saviour for Environment with Particular emphasis on Hinduism" pg. 5, Available at: <http://www.iitk.ac.in/infocell/announce/convention/papers/Context%20and%20Human%20Resource-04-Nandita%20Verma.pdf> (Last visited on March 27, 2017).

of Buddhism which had been founded by Goutam Buddha around 500-550 B.C. Buddhism emphasises very much over the rational use of natural resources by mankind. This religious thought used to preach people about this behavioural ideology that high degree of human satisfaction might be achieved by means of a relatively low rate of material consumption and it helps people to live without pressure and strain.¹¹

From the viewpoint of the Buddhist concept of karma, the environment is considered to be derived from the karma seed. It is described in the text of Abhidharma-nyayanusara (Junshori-ron) that mountains, rivers, the earth and so on are born from common karma (gu-go), and living beings are born from individual karma (fugu-go). Individual humans are, therefore, born from individual karma (fugu-go), and the natural environment of mountains, rivers and the earth is produced by common karma (gu-go) of the human race¹². The improvement of the karma of humans will improve its environment resulting from common karma¹³.

The teaching of Buddha speaks for tolerance and reverence behaviour not only towards human beings but also towards all living beings including the plants and trees. Under this religious teaching, every follower of Buddha should implant trees every year and look after those plants until they are safely grown up. According to the spirit of this religious belief, one should abstain from killing animal either as a pastime pleasure or even for sacrifice. Buddhism not only forbids the destruction of animal life, but also regards it as a duty of human being to take care of the well being of all animals.¹⁴ Cutting of trees, destruction of birds and pollution of water are also forbidden under Buddha's preaching that shows respects towards the norms of ecology¹⁵.

From a Buddhist perspective, solving environmental problems and contributing to their elimination is in itself part of the practice of Buddhism. In other

¹¹Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pg. 127 (Kamal Law House, Calcutta, 1st Edn., 2009).

¹² Shuichi Yamamoto and Victor S. Kuwahara, *How does Buddhism Contribute to the Environmental Problems?*, Vol. 11, The Journal of Oriental Studies, pg. 167 (Plenum Publishers, New York, 2005).

¹³ *Ibid.*

¹⁴ Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pg. 127 (Kamal Law House, Calcutta, 1st Edn., 2009).

¹⁵S.S. Tripathi, and Acharya Bhante, "Buddhism and the Ecological Crisis" cited in O.P.Dwivedi, *World Religions* pg. 188 (Gitanjali Publishers, New Delhi, 1989) .

words, solving environmental problems is a natural aspect of the Buddhist philosophy. The Bodhisattva ideals under the Buddhist religion consisted of six paramitas. The six paramitas are composed of Dana paramita, Sila paramita, Kshanti paramita, Virya paramita, Dhyana paramita and Prajna paramita. Dana paramita means giving a fortune, preaching a law or removing fear, i.e., doing something good without regret for a person and nature, Sila paramita means keeping precepts such as not hurting or killing living entities and not stealing, Kshanti paramita means enduring sadness and pain, Virya paramita means doing your best and always making effort to do better, Dhyana paramita means being unwavering or steadfast in all endeavors, and Prajna paramita means obtaining true cognition of wisdom from the concepts of “dependent origination” and the “middle-way.”¹⁶

4.1.3 Jainism

The Jainism which was preached and propagated by Lord Mahavira laid emphasis on maintaining harmony between man and man and between man and nature. This religious belief had laid emphasis on minimum consumption and destruction of living and non-living resources for the satisfaction of material needs and comfort of the human being. The spirit of the Jain precept is based on Ahimsa. Jainism prohibits eating of any kind of meat. Ahimsa has been given the greatest importance and has been called as the highest virtue i.e. paramodharma. So this type of religious teaching of the Jain faith and belief is clearly upheld the virtue the protection and preservations of the natural environment. It is mandatory for the Jains to renounce fifteen monastic vows known as Karamdan and some of the vows consist of environmental matters are Vankarm, Sphotrak Karm, Nirlanchan Karm and Asatipashan Karm which deserve special mention.¹⁷ The idea of ahimsa argues that all living beings deserve freedom from violence and therefore, meat eating is considered to be the biggest enemy of righteousness, purity and goodness in Jainism. It insisted upon vegetarianism to protect animals from harm and ensure their own positive karmic rebirth.

¹⁶ Shuichi Yamamoto and Victor S. Kuwahara, *How does Buddhism Contribute to the Environmental Problems?* Vol. 11, The Journal of Oriental Studies, pgs. 78-79(Plenum Publishers, New York, 2005).

¹⁷ P.L. Bhargave, “The Jain Concept of Ahimsa”, cited in R. C. Dwivedi, *Contribution of Jainism to Indian Culture* pg. 120 (Motilal Banarsidass, New Delhi, 1st Edn., 1975) .

The Jain scriptures preaches matters relating to environment, such as, not to injure, abuse or oppress, enslave, insult, torment, torture and kill any creature or any living being. The basic thrust of Jainism is on non-violence and regards for life. It also emphasises protection of living creatures. Jainism condemns the sacrifice of animals to the sacred fires. It disapproves captivity, whipping, overloading and depriving animals from adequate food and drink. Jainism is also based on the principle of simplicity which is close harmony with nature and helps in protecting and preserving the nature¹⁸.

4.1.4 Sikhism

“The Lord infused His Light into the dust, and created the world, the universe. The sky, the earth, the trees, and the water - all are the Creation of the Lord”-Guru Granth Sahib

Sikhism emerged, as another religious belief which is comparatively a recent one. In the Guru Granth Sahib it has been described that the purpose of human beings is to achieve a blissful state in harmony with the earth and all creation. It considers every creature to be the incarnation of God and therefore, the conservation and preservation of the same are the essential principles. According to Guru Nanak, the founder of Sikh religion, “Air is vital force, water the progenitors, the vast earth the mother of all, day and night are nurses fondling all creation in their lap¹⁹. This implies that a sacred relationship with the environment is crucial in maintaining a spiritually healthy and ecologically balanced planet.

According to religious belief of Sikhism, there is one way, one love, one beauty that shines through air, water and fire. Actually, it speaks of integrity and unity of the world environment. As per this belief, the world community is considered as one of a single family living in a harmonious, unified environment and the person, who can respect this sense of world unity under environment perspective, can survive with honour and dignity. This religious thought expresses its most precious virtue of protecting and preserving the natural environment through its preaching and teaching.

¹⁸ Dr. Rajender Verma, *Management of Natural Resources and Laws in India* pg. 30 (Laxmi Book Publication, Maharashtra, 2016).

¹⁹ *Ibid.*

In the Sikh scripture, Guru Granth Sahib emphasise has given that the human beings are composed of five basic elements of nature i.e., earth, air, water fire and sky. This establishes a close relationship between nature and mankind. It also emphasized on sustainable use of natural environment and its resources for the benefit of mankind in respect of food, nutrition, health and good living. In Guru Nanak Bani (Religious speech of Sikhism), the term ‘jagat’ refers to the world and convey the idea regarding creation of it from the elements like, water, fire and air, as created by the God. So according to Sikhism, the inherent spirit of God is present in nature and its every element. From this religious thought, it appears that Sikhism also bears the same traditional Hindu religious notions that nature is the creation of God and a part of it and it is the object of love and respect. So in this way, Sikh religious faith and belief also embrace the spirit of environment protection through its religious teaching and preaching.²⁰ People should identify their position in universe and should respect the creation of god. They believe that the every survival depends on environment.²¹ According to Holy Scripture of Sikhs, Guru Granth Sahib, the creation and dissolution of universe occurs from divine command; God is the source of birth, substance and destruction. Thus for sikh’s divinity lies in nature and to meet their needs without over exploiting the nature.

4.1.5 Islam

The Islam religion depicted harmonious relations between man and nature. The Holy Quran declares that Allah created the heaven and the earth, from clouds he released water. It consisted of mountains, hills and dales, valleys and slopes, rivers and springs, forests and the plains have been provided where animals, birds and different other living creatures including human beings would live in peace and harmony with nature. On earth he made rivers and raised mountains. Under the Islamic religion everything is created from water. Allah is considered to be the owner of land and mankind is the trustee or guardian, whereas, the other living creatures are considered to be the beneficiaries. Destruction of nature is the destruction of “Ayyat

²⁰ Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pg. 126 (Kamal Law House, Calcutta, 1st Edn., 2009).

²¹ Jolly Surjif, “Sikhism and the Environment,” cited in O.P.Dwivedi, *World Religions* pg. 301(Gitanjali Publishers, New Delhi, 1989).

of Allah”²². Under the domain of Islamic religious thought and belief, the environment and ecology are considered as the subject matter of immense importance to make the society a habitable one with proper peace and tranquility.²³ To enter into peace, another meaning of Islam postulates that a Muslim should make his place a peaceful abode by maintaining peace and tranquility not only with God but also with other cohabitants, without doing any evil or causing any injury to them.²⁴

It is interesting to note that the word ‘nature’ which is an abstraction cannot be found in the Qur’an and the closest modern Arabic usage is the word bi’a which connotes a habitat or a surrounding. The Qur’an speaks of creation (khalq) and it contains two hundred and sixty one verses where this word is used in its various grammatical forms derived from the root kh-l-q. These verses contain references to the human world; to the natural world of the planet from trees to turtles, from fish to fowl; and to the sun, stars and skies. The very first revelation of the Qur’an to the Prophet used this word in its verb form to dramatic effect, “Recite in the name of your Lord who created, created man from clots of blood” (Al-‘Alaq, 96:1,2). Creation is the fabric into which the tapestry of life is worked²⁵.

The holy Quran’s message is unity, harmony, balance and order representing the sustainable development. One should not alter the environment or disrupt the balance. If any such damage is caused to environment, it is considered as fasad (mischief).²⁶ Islam is against the cutting or destruction of plants and trees unnecessarily. In Hadith, Prophet Mohammad said “He who cuts a lote-tree without justification, Allah will send him to Hellfire²⁷. Regarding the preservation of animals and species the Quranic verse says that all living things are partners to man in existence and they deserve our respect. We must be merciful toward animals and

²² Dr. Rajender Verma, *Management of Natural Resources and Laws in India* pgs. 28-29 (Laxmi Book Publication, Maharashtra, 2016).

²³ Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pg. 126 (Kamal Law House, Calcutta, 1st Edn., 2009).

²⁴ *Ibid.*

²⁵ The Royal Aal al-Bayt Institute for Islamic Thought, *Islam and the Environment Ethics and Practice*, The 15th General Conference, pgs. 6-7 (27-29 Sept., 2010), Available at: <http://www.aalabayt.org/EnvConference/018.pdf> (Last visited on March 15, 2017).

²⁶ M. Rafiq and Muhammad Ajmal, “Islam and the Present Ecological crisis”, cited in O.P. Dwivedi, *World Religions* pg. 119 (Gitanjali Publishers, New Delhi, 1989).

²⁷ Dr. O.M. Ashtankar, “Islamic Perspectives on Environmental Protection” Vol. 2 International Journal of Applied Research pg. 440 (2016).

strive to ensure the preservation of different species²⁸. Therefore, the social, cultural and religious dimensions and values in Islam helped in the protection of environment. The best way to protect the environment from destruction and, indeed, to improve its condition is to revive these forgotten understandings by referring back to the teachings and instructions of divine religions and reviewing and readjusting our policies regarding the application of modern technology and in using natural resources appropriately.

4.2 Ancient Civilisations in Protecting the Environment

Ancient civilisations which are considered as the oldest civilisation of the world had originated and spread in close association with nature. The people of ancient India were the custodians of nature with highly evolved civilisation. All civilisations evolved by balancing the human needs and surrounding environment. Indians enjoy the plethora of natural resources endowed to them by their ancestors. It has rich and diverse ecosystems.²⁹ The rich natural resources which people enjoy today are the result of wise resource management and allocation strategies followed by their ancestors. Their approach towards life was very comprehensive, highly integrated with the environment and therefore, was ecologically sound and sustainable³⁰. The sages and rishis identified man as an integral part of nature and stressed the importance of maintaining complete harmony with all the living and non-living components of earth. They identified human environment from the point of view of physical, chemical, biological and social process that influences directly or indirectly the health and well – being of the human kind³¹. For the sake of clarity it can be understood under the following heads:

4.2.1 Pre-Vedic Period

Pre-Vedic period is the most ancient time in the history of India. Mohenjodaro and Harappa civilisations are known as the most ancient civilisation of India

²⁸ *Ibid.*

²⁹ Chandan Kumar Gautam and Anand Prem Rajan, “Ecocentrism in India: An Incredible Model of Peaceful Relation with Nature” Vol. 4 Universal Journal of Environmental Research and Technology pg. 1 (2014).

³⁰ P.Pushpangadan, Jyoti Sharma, *et al.*, “Environmental Health and hygiene in Ancient India: An Appraisal” Vol. 7 Ancient Science of Life pg. 1, (Jul.-Sept. 1987).

³¹ *Ibid.*

during pre-Vedic period, although a doubt exists as to which period can properly be said as pre-vedic, vedic and later vedic. However, to have a detailed knowledge regarding ancient Indian environmental issue such division is discernible.

4.2.1.1 The Indus Valley Civilisation

The Indus valley is one of the world's earliest urban civilisations, Inhabitants of Harappa and Mohenjo-daro, the ancient Indus river valley civilisation, developed new techniques in metallurgy and handicraft. The civilisation is noted for its cities built of brick, roadside drainage system, and multistoried houses³².

Evidence regarding the environmental history of India can be traced back in the mature phase of a civilisation known as the Harappan civilisation, considered as the first of its cities to be unearthed was located at Harappa, excavated in the 1920s in what was at the time the Punjab province of British India (now in Pakistan). Perhaps the most unique feature of the Harappan civilisation was the development of urban centres. Let us look at one such centre, Mohenjo-daro, more closely. Although Mohenjo-daro is the most well-known site, the first site to be discovered was Harappa³³.

During pre-Vedic period in Indus valley region, where Harappa and Mohenjo-daro are located, the life of ancient Indian people had attained to such height that could easily be compared with modern age. So far as country and town planning is concerned, it was really astonishing. Sense of public health and hygiene of the people was very high. Architects and country planners were well aware about the danger of mixing of drinking water and sewage, if proper care and attention would not have been taken and that is why they always gave proper attention in both supply of drinking water and maintenance of sewerage system, so that contamination of drinking water with sewerage water could not have taken place. There was very good underground sewerage system in Harappa and Mohenjo-daro. At that time special care and attention were taken regularly for sewerage treatment in those two towns, and for that treatment purpose 'soak pits' were constructed there in different places

³² Anonymous, *Indus Valley Civilisation* pg. 2, Available at:

<http://fileservet.nettexts.com/asset.aspx?dl=no&id=4821> (Last visited on March 30, 2017).

³³ *Brick, Beads and Bones: The Harappan Civilisation* pg. 5 (2015-16) Available at : www.ncert.nic.in/ncerts/l/lehs101.pdf (Last visited on March 28, 2017).

within the sewerage system. There was not a single open drain and all were covered with very good cover made up of either stone or concrete.³⁴

There was a very good system for cleaning the sewerage and water supply pipe and those were regularly cleaned. There was also a special arrangement for dumping of all the garbage and wastes of the town outside the two towns, in deep ditch. It was an excellent example of maintenances of public health and hygiene. There were also special arrangements for discharging of solid municipal waste products and polluted water and the entire system was conducted with high degree of care and cautions to avoid any kind of risk of pollution in drinking water due to contamination by polluted sewerage water.³⁵

In the Indus valley region, the burial system was also very much scientific and aiming at prevention of the environmental pollution. Bodies were interred in deep graves lying extended north and south on stone slabs and such tombs were surrounded by stone circles. The Indian megalithic tombs, of which hundreds have been found in the peninsula, usually contain iron objects may be assigned to the early Iron Age. Many prehistoric crematories were found in Tinnevely District, in Northern ancient India covering an area of 114 acres.³⁶ Thus, there is no doubt that this type of arrangements were made only to protect the human environment and hygiene in those days.

4.2.1.2 Aryan Civilisation: The Beginning of Hinduism

The Vedic people, who called themselves Aryas or Aryans, invaded Northern India from Central Asia evolved separately from the Indus civilization. Our knowledge of the early Aryans comes mainly from the Rig Veda, the earliest of the Vedas³⁷. The continuation of environmental awareness can be seen in the Aryan civilization also where the ecological awareness find place in their notion of 'Aranyani', meaning 'queen of forests' as envisaged by the Vedic seers. This can be likened to the idea of tree goddesses of the Indus civilization. There are several

³⁴ Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pgs. 118-119 (Kamal Law House, Calcutta, 1st Edn., 2009).

³⁵ *Ibid.*

³⁶ Vincent A. Smith, *The Oxford History of India* pg. 3 (Oxford, London, reprinted 2nd Edn., 1941).

³⁷ Dr Raj Pruthi (Eds.), *Vedic Civilisation* pg.1(Discovery Publishing House, New Delhi, 2004).

descriptions in the Vedas regarding praise to Aranyani, the spirit of the forest which guides and protects the plants and wild animals. The Aryans observed nature in all its true aspects.³⁸ Regarding planting of trees, each year of a man's life, right from the year of his birth until the age of his retirement at sixty, surrounded with the obligation to plant new trees in place of trees that fell or withered away. Responsibility for planting yearly trees initially fell on parents and the task was then passed on to the son and his wife, a year after marriage³⁹. The Aryans had respect towards cow and other animals. Cows were ushered in, to milk them on the spot, to serve, first the children, and then adults. The Aryans were concerned for waste, especially human waste. There was a man Karkarta who was given charge of improving drainage system and environmental aspects; later he was promoted as Town Planner and became President of the Architects Guild. He is credited to have said:

“An animal, an insect a fish creates no waste and no hazard, but each human being creates a waste of 1,100 times his body weight and hence twice the hazard.”⁴⁰

4.3 Vedic Approach to Environment

Veda i.e., the treasure house of knowledge⁴¹ is the oldest religious document containing various hymns relating to subjects like linguistic, mathematics, astrology, natural science like physics, chemistry, biology, botany, medical science, ecology etc. Subject like ecology for the protection and cleaning up of environment was given priority and formed part and parcel in the daily lives of the people incorporating the same in the folklore, art, culture and religion. Vedas are the absolute religious authority for Hinduism that categorically explained the rule of nature, principle of food, life, intellect and immortality. The Vedic and Puranic literatures, in the Upanishads, Arthashastra, Charak Samhita, Ramayana and Mahabharata are all based on Hindu religious philosophy⁴². Like all other religions in India, under Hindu religions also the omnipresence of God can be found in nature-in rivers, mountains,

³⁸ Ms. U. Rajani Rao, “Environment awareness in ancient India” Vol. 2 International Journal of Life Sciences Research pgs. 2-3 (April-June 2014).

³⁹ Bhagwan S. Gidwani, *Return of the Aryans* pg. 7 (Penguin Books India, 2nd Edn., 2000).

⁴⁰ *Ibid* at pg. 333.

⁴¹ Rajib Sarmah, “Environmental awareness in the vedic literature: An assessment” Vol.1 International Journal of Sanskrit Research pg. 6, (2015).

⁴² R. Renugadevi, “Environmental ethics in the Hindu Vedas and Puranas in India” Vol. 4 African Journal of History and Culture pg. 1 (Jan., 2012).

forest and all forms of life . It is considered a sacred duty to protect them. Birds and animals have been identified with Gods, for instance, elephant with Indra, rat with Ganesh, lion with Durga etc⁴³. In Hindu theology forests, trees and wildlife protection held a place of special reverence. The theology prescribed for temple forests and trees were worshipped as a ritual. Therefore, the ancient Indian scriptures thus have enough to reveal about the protection and maintenance of ecological balance. The Vedas, Upanishads, Puranas and other scriptures of Hindu religion give a detailed description of trees, plants and wildlife and their importance to the community.

Vedic man was nature centered for him the nature and its phenomena were part of eternal divine design.⁴⁴ The Vedic prayer invokes and postulates divine intervention to bliss and protect the nature environment⁴⁵.

4.3.1 Four Vedas

Veda comprised of the four Vedas i.e. Rig Veda, Sama Veda, Yajur Veda and Atharva Veda consisted of full of hymns and recognises explicitly the importance of nature and advocate the supremacy of different natural power. In fact, Rigveda hymn is dedicated to praise all of the healing properties of trees. The nature has been personified and worshiped as different Gods. For instance, the Rigv Veda has a description of thirty three Gods distributed in the three divisions of the universe, i.e., earth, air and heaven.⁴⁶ They have been glorified and worshipped as givers of health, wealth and prosperity. It also highlights the potentialities of nature in controlling the climate, increasing fertility and improvement of human life emphasising for intimate kinship with nature. Some of the Vedic deities representing the phenomenon of nature are: Indra, Maruts (the storm deities), Vayu (the god of wind), Parjanya (the god of rain and water), Jal (the god of water), Prithivi (the earth), Dyaus (the god of sky), Agni (the fire god), Varuna (the god of the sky, water and celestial ocean, as well as the god of law), Mitra (the god of friendship and alliances), Savitr (the solar deity), Pusan (the pastoral god), prajapati(the lord of creatures), Asvins (the god of wonder

⁴³ Sunit Gupta, *Environment and Social Issues* pgs. 145-146 (Sarup & Sons, 1st Edn., 2000).

⁴⁴ R.T. H.Griffith , *The Hymns of Atharva Veda* pg. 12(Evinity publishing Inc, 1st Edn., 2009).

⁴⁵ Om Krishna, "Environmental Discourses in Vedic Period" Vol. 4 International Journal of Social Science and Humanities Research pg. 485 (Jan.-Mar., 2016).

⁴⁶ S. Upinder, *A History of Ancient and Early Medieval India: From the Stone Age to the 12th Century* pg. 195 (Pearson Education, India, 2008).

works and miraculous healing power), Gandharvas (the aerial spirits), Surya (the Sun), the goddesses usas' (dawn) and Ratri (night). It also states that the sun causes evaporation and brings rainfall.⁴⁷ Surya has also been enchanted in the sacred Gayatri mantra/hymn.⁴⁸ Many rivers have been recited in the Nadistuti (prayer of river) hymns of the Rigveda.⁴⁹ The river Ganga, Yamuna and Saraswati finds a special place in Indian cultural and social traditions. They are respected as mothers. Even mountains like the Kailash, the Barabar and the Govardhan are considered sacred. They are believed to be associated with some gods or goddesses.

The Rig Veda describes the various components of eco-system which were later rediscovered by modern scientists. It states the plant as "God for Gods" thus giving it precedence above mythological God Indra (god of rain and thunderstorms) and the other Gods. Cutting or uprooting the green trees has been described sinful job; as it may break the food chain and thus may bring instability in the ambience.⁵⁰

The Sama Veda mainly contains verses. These singing hymns are mostly taken from the Rigveda. In Sama Veda, the sacrificial fire is compared to a stallion that can stave off the insects.⁵¹ In ancient India, places of worship were mostly located in jungles. People did not see much difference between nature and God. There might have been a method to make people aware that nature is also a divine establishment and should not be interfered unnecessarily. Protection of nature and preservation of natural resources were very much religious and an accepted mode of worshipping god.

The Yajur Veda mainly contains information about rituals.⁵² It emphasises to protect the animals as they are extremely important and helpful to environment⁵³. A

⁴⁷ S. Prasoan, *Panch Mahabhuta Tatwa And Sharira* pg.102 (Hindology books, Pustak Mahal, Delhi, 2008).

⁴⁸ S. Radhakrishnan, *The Principal Upanishads* pg. 299 (Harper Collins publishers India, 1953).

⁴⁹ P.N. Chopra, B.N. Puri, M.N. Das, *et. al., A Comprehensive History of Ancient India* pg. 25 (Sterling Publishers Pvt. Ltd., New Delhi, 2003).

⁵⁰ A.Goel and S.L. Goel., *Human Values and Education* pg. 123 (Deep and Deep Publications Pvt. Ltd., New Delhi, 2005).

⁵¹ Km. Saroj Gupta, "Environment Ethics, Policies and Inclusive Environment Protection Mechanism in India (With Special Reference to Environmental Inquisition)" Vol. 5 Journal of Environment & Earth Science pg. 113 (2015).

⁵² J. Gonda, "A History of Indian Literature: Veda and Upanishads" pg. 11 (Wiesbaden: Otto Harrassowitz, 1975).

⁵³ H. Mandalia, Y.Rupala, *et. al., "Bio-cultural Importance of Indian Traditional Plants and Animal's For Environment Protection," Review of Research,* pg.1 (2012).

ruler should never kill animals which are useful in agriculture like bullocks or cows which gives us milk. It is a punishable crime if a person kills or harms such animals⁵⁴. Killing is considered as the most sinful act in Hindu religion. This type of religious belief and sacredness has kept the public away from exploiting these natural resources due to the fact that the relationship with nature and the animals should not be that of dominion and subjugation but of mutual respect and kindness.

Atharva Veda considered trees as abode of various gods and goddesses. Atharva Veda emphasises that relationship with nature and animals should not be that of dominion and subjugation but of mutual respect and kindness. Atharva Veda prayers, “whatever, I dig from thee 'O' Earth, may that have quick growth again, 'o' purifier, may we not injure the vital heart.”⁵⁵ Many animals and plants were associated with gods and goddesses so that they were preserved for the future generations. It has also been associated with supernatural powers and no one dared to misuse the resources and therefore it acts as a check on the overuse of resources. The Athar Veda defines the relationship between green plants and the sun in maintaining the weather conditions necessary for the continuation of life on this planet. It states that plants and herbs destroy the poison pollutants. In fact it establishes the significance of the sun as the ultimate source of energy on earth and green plants as primary producer. It also says about the elimination of toxins from plants and herbs that aid in the biological treatment and maintenance of healthy biogeochemical cycle. The significance of purity and quality of water has also been highlighted. It talks about herbal ways of treatment of diseases.⁵⁶ The Bhumisukta of Atharva Veda considers 'Bhumi' *i.e.*, the earth, as the personified mother goddess. Killing of innocent animals was considered to be a sinful act. It is she who nourishes us all like a loving mother nurtures her sons. In fact the earth in Bhumisukta doesn't merely represent the land, but all that which is part of the environment. She symbolises the three principal components of environment, land water and air. At the liquid level 'Bhumi' is the sustainer of oceans, river sand waters.

⁵⁴ P.Pushangadan, Jyoti Sharma, et al., “Environmental Health and hygiene in Ancient India: An Appraisal” Vol. 7 Ancient Science of Life pg. 91, (Jul.-Sept. 1987).

⁵⁵ Dr. I. A. Khan, *Environmental Law* pg. 22 (Central Law Agency, Allahabad, 2nd Edn., 2002).

⁵⁶ M.Bloomfield, “Hymns Of The Atharva-Veda” (1897), *Available at*: <http://hudsoncress.net/hudsoncress.org/html/library/india/Atharaveda.pdf> (Last visited on June 8, 2015).

Similarly, trees and plants have been regarded as indispensable in the life of human being. They considered reverence, a good scalpel and protector from the evils with a concept of dwelling of many God and Goddesses living in it. However, the sense of utility behind worshipping cannot be ignored. Following are some of the trees associated with the God and Goddess.

- a. Lotus-Laxmi (Goddess of Wealth).
- b. Vat (Banyan)-Brahma(Creator of Universe).
- c. Ashoka-Buddha, Indra.
- d. Kadamb-Krishna.
- e. Palasa-Brahma, Gandharva.
- f. Need-Sitala, Manasa.
- g. Fig-Vishnu, Rudra.
- h. Mango-Laxmi, Govardhan.
- i. The Pipal-Vishnu, Krishna.

Thus, the Hindus have received their religion through revelation, the Vedas which depicted the dependency of ancient Indians solely on the nature. Trees are worshipped as Vriksha Devta (Tree Deity) with prayers, offering of water, flower, sweets and encircled by sacred threads. Planting of trees is also regarded as sacred religious duty and work of great virtue. The nature and religion have been directly connected in all aspects of life and thereby the protection and preservation of the nature has always given priority in the self interest of human being. Matsya Puran has regarded one tree equal to ten sons. According to Vaha purana one who plants one papal, one neem, one ber, ten flowering plants or creepers, two pomogranases, two oranges and five mango trees will not go to hell. Therefore, cutting of trees and destruction of flora was considered a sinful act. Charak Samhita has considered the destruction of forests as the most dangerous act for humanity and its welfare.⁵⁷ The

⁵⁷ R.B.Singh and Suresh Mishra, *Environment Law in India: Issues and Responses* pg. 103(Concept publishing Company, 1996).

destruction of forests is most dangerous for the nation and for human beings. Vanaspati (vegetation) has direct relationship with the well being of the society. Due to the pollution of natural environment and the destruction of Vanaspati, many diseases crop up to ruin the nation. Only then Vanaspati with medicinal qualities may enhance the nature and cure diseases of human beings.⁵⁸

4.3.2 Upanishads

The Upanishads, the secret doctrine form the Vedanta (the end of the Veda) are probably the most important part of the Veda.⁵⁹ Ranging between 1500 and 600 B.C., a great deal of the Upanishads is in dialogue form. It is found in the concluding sections known as Aranyaka part of the Veda. It explained the inter-relations between the various components of nature. Water known as 'jeevan' has depicted water as the strength and source of all energy for all living organisms on the earth. The other natural resources especially forest was considered as the 'van devta' also a source of natural energy and to be worshipped. In the exposition of the evolutionary process of human life by Upanishads, the earth is the disembodied spirit of nature; water is the essence of earth; vegetation is the essence of water; human life is the essence of vegetation; meditation is the essence of human life; recitation is the essence of meditation; harmony is the essence of sanitation and the existence of human beings in totality⁶⁰.

The Upanishads sages perceived the existence of God in trees and other plants and those they were gifted to man as a companion for mutual survival. "The God who exists in the universe, lives in air, water, in fire and also in trees and herbs, men should have reverence for them". Brhadaranyaka Upanishad (3.9.28) equate trees with human beings as follows: Just like a tree, the prince of the forest, so the man is, in truth.⁶¹ In the Taittiriya Upanishad (5.101) certain norms were prescribed for human beings to keep the environment clean. "One should not cause urine and stool in water,

⁵⁸ *Ibid.*

⁵⁹ Charles S. Braden, *The Scripture of Mankind: An Introduction* (The MacMillan Company, New York, 1952).

⁶⁰ Km. Saroj Gupta, "Environment Ethics, Policies and Inclusive Environment Protection Mechanism in India (With Special Reference to Environmental Inquisition)" Vol. 5 Journal of Environment & Earth Science pg. 113 (2015).

⁶¹ R. Renugadevi, "Environmental ethics in the Hindu Vedas and Puranas in India" Vol. 4 African Journal of History and Culture pg. 3 (Jan., 2012).

should not spit in water; and should not take bath without clothes". The Iso-Upanishad has revealed the secrets of existence of life on earth and the importance of every organism for mutual survival. The universe along with its creatures belongs to the Lord. No creation is superior to any other⁶².

The verses of the Iso-Upanishads envisage that human beings should not be above nature and no species encroaches into the rights and privileges of other species indicates that the modern civilisation armed with technological weapon, should not interfere into the rights of all other life forms on earth by using, misusing, exploiting and over-exploiting the finite and scarce natural resources of earth. The concept of sustainable development which the modern environmentalists are harping upon to use the natural resources judiciously for a more stable development and without impairing with the abilities of the future generations to use those resources, and without interfering into their living rights was perhaps inspired by these verses of the Iso-Upanishad.⁶³

The Upanishads show a broad division of the flora into oshadhi, vanaspati and vrksha. The Chandogya indicates a distinction between the cultivated grains and the oshadhi-vanaspati in general. Soma is said to have been the king of vanaspatis, in fact the term vanaspati itself means the lord of the forest.⁶⁴

Unlike the flora, the fauna could also be divided into two categories-the Gramya or domesticated animals and the Aranya or wild beasts. The Chandogya Upanishad divides all living creatures into three parts according to the manner of their birth-

1. Andaja (oviparous), springing from the egg,
2. Jivaja (viviparous), springing from a living being and
3. Udbhija, springing from a germ⁶⁵.

The animals were held in very high esteem by the Upanishadic people. They meditated on the fivefold Saman with the image of the animals in their eyes: One should meditate on the fivefold Saman among the animals, the goats as the syllable

⁶²*Ibid.*

⁶³*Ibid.*

⁶⁴ Dr. Subhra Sharma, *Life in the Upanishads* pg. 52 (Abhinav Publications, New Delhi, 1995).

⁶⁵ *Ibid* at pg. 55.

him, the sheep as the prastava, the cows as the Udghitha, the horses as the pratihara and the human being as the nidhana⁶⁶.

Among all the animals, domestic or otherwise, the cow was the most important. Its milk shared by men and animals, was one of the seven foods created by Prajapati. Milk and all its products were the most favourite items in the dietary. The cow was also a measure of value. Things were bought in exchange with the cow; rewards and fees were given in the form of cows and even the philosophical meditations promised rich dividends in cows. Even weak and old cows were kept and fed and not driven away or sold. Cow was given as a symbol of speech.

4.3.3 The Puranas

In Puranas had also shown great concern towards the protection of environment and the flora and fauna. In the Padma Purana, it is mentioned that trees like, pipal, bel, ber, neem, etc., are the home of God and are not to be cut. This indicates that trees were sanctified by the people who through religion tried to conserve vegetation and forest. The Agni Purana even prescribed death penalty for pollution of ponds⁶⁷. The Varah Purans (172.39) says that “One who plants a peepal (*Ficus religiosa*), one neem (*Azadirachta indica*), one Banyan (*Ficus benghalensis*), two pomegranates (*Punica granatum*), two orange (*Citrus reticulata*), five mango trees (*Mangifera indica*) and ten flowering plants or creepers shall never go the hell”. The practice of “Vanmahotsava” (Tree Plantation Ceremony) is over 1500 years old in India and is found in the Matsya Puran. Agnipuran says that the plantation of trees and creations of gardens leads to eradication of sin. In Padma Puran (56.40-41) the cutting of a green tree is an offence punishable in hell⁶⁸.

In Narshimha puran trees have been personified as God (Brahma) Himself. It is said in Skandpuran that Peepal is supreme to all other trees as Lord Vishnu is to all other Gods. Varahpuran advocates regular plantation of a tree as a means to achieve heaven. In Matsyapuram plantation of a tree has been equated with progeny of ten sons. Matsya Puran has regarded one tree equal to ten sons. According to Vaha purana

⁶⁶ *Ibid.*

⁶⁷ Dr.Benudhar Patra, “Environment in Early India: A historical Perspective” Vol.1 Environment: Traditional & Scientific Research pg. 46 (Jan.-June, 2016) .

⁶⁸ *Ibid.*

one who plants one papal, one neem, one ber, ten flowering plants or creepers, two pomogranases, two oranges and five mango trees will not go to hell. Therefore, cutting of trees and destruction of flora was considered a sinful act.⁶⁹ Similarly, in Skandpuran a long list of trees has given the cutting of which is prohibited.

Apart from the protection of trees, Narasimha puran also envisages protection of animals and birds. Killing of birds for eating was prohibited in the following language “O, wicked men if you kill a bird then you are bathing in a river, pilgrimage, worship and yagnas are all useless”. Similarly, in the Vishnu Puran protection of the animals can be found where it is mentioned that “God Keshava is pleased with a person who does not harm or destroy other creatures or animals”⁷⁰.

Even in Ramayana and Mahabharata where in we find reference of beautiful forests of Dhandakaranya, Nandavana and Khandavana, destruction of forests was considered to be a great sin.⁷¹

4.3.4 Manusmriti

Manusmriti is the world’s first ethical compendium on human jurisprudence, presented by Maharshi Manu, originated sometimes immediate to the post Vedic age.⁷² Consisted of twelve Chapter and two thousand six hundred and eighty four verses,⁷³ Manusmriti focused under different chapters on different environmental aspects. It has direct and indirect references about conserving plants and animals with punishments specified for disobeying and harming the trees and animals. It also gives a distinctive taxonomy of plants while stating that some of the plants have consciousness, and experience pleasure and pain and have awareness.⁷⁴

According to Manusmriti, he who injures un-harmful being for pleasure will never find happiness. One who does not cause suffering to living creatures and desires the good of all beings obtains endless blessings and respect. Such people have great

⁶⁹ Kailash Thakur, *Environment Protection Law and Policy in India* pg. 102 (Deep & Deep Publication Pvt. Ltd., New Delhi, Reprinted 2007).

⁷⁰ *Ibid.*

⁷¹ Dr. I. A. Khan, *Environmental Law* pgs. 102-103 (Central Law Agency, Allahabad, 2nd Edn., 2002).

⁷² Sayan Bhattarcharya, “Forest and biodiversity conservation in ancient Indian culture: A review based on old texts and archaeological evidences” Vol. 30 International Letters of Social and Humanistic Sciences pg. 37 (2014).

⁷³ Sachidananda Padhy, Santosh K. Dash *et. al.*, “Environmental Laws of Manu: A Concise Review” Vol. 19 Journal of Human Ecology pg. 2 (2006).

⁷⁴ Ms. U. Rajani Rao, “Environment awareness in ancient India” Vol. 2 International Journal of Life Sciences Research pg. 4 (April-June 2014).

will power and they can achieve anything they strongly wish. The use of meat as food has been shunned as they are obtained by killing living animals. Manusmriti also talks about the judicious use of the natural resources.⁷⁵

Filthy substances like urine, faeces, saliva, cloths defiled by impure substances, blood, poisonous things and any other substance considered to be impure, should not be thrown to water body. Garbage like hair, ashes, bones, potsherds, cotton seeds and chaff are not to be dumped in public places; one should avoid stepping on such substance. Waste products like urine, ordure, water used for washing the feet, water from the bath and remnants of food should be made transferred far away from the dwelling⁷⁶. It also envisages that dwelling in a place where diseases are endemic should be avoided. Things used for cleaning the body, water used for a bath, urine, ordure, blood, mucous or anything spat out or vomited should be carefully avoided to step on⁷⁷.

Provisions of punishment for the killing of different animals have been laid down in the Manusmriti. The punishment followed for the sinful killing of snakes, toad, small fishes, small animals with or without bones, insects and destroying of any kind of creatures that breed in food, condiment, fruits and flowers. Injuring medicinal plants and cutting down green trees for firewood, cutting of fruit trees, shrubs, creepers, lianes, flowering plants, destroy of agricultural species for no good purpose and all plants that spontaneously spring up in forests should be followed by penance.⁷⁸

4.3.5 Arthashastra

Kautilya, author of the book Arthashastra and a minister of the Maurya king Chandragupta, India's first emperor provides detailed instructions on different environmental issues especially on the protection and management of forests, orchards etc. The Mauryan period was perhaps the most glorious period of the Indian history from environment protection point of view. In his Arthashastra, written

⁷⁵Chandan Kumar Gautam and Anand Prem Rajan, "Ecocentrism in India: An Incredible Model of Peaceful Relation with Nature" Vol. 4 Universal Journal of Environmental Research and Technology pg. 92 (2014).

⁷⁶*Ibid.*

⁷⁷*Ibid.*

⁷⁸*Ibid* at pg. 11.

between 321 B.C. and 300 B. C. we find among others,⁷⁹ detailed and elaborate provisions on the environment. The necessity of forest administration was realised and the outcome was the appointment of a superintendent of forest.⁸⁰ Forests were classified on functional basis one of which was productive forest. He was to conduct productive works in forests and also to fix adequate fines and compensation for causing any damage to the productive forests except caused in natural calamities and it would be levied from the person who would be responsible for it. Timber forests and elephant-forests were permitted to be exploited by none other than the ruler. Spies in the guise of traders were entrusted with a duty to ascertain the quantity and price of the royal merchandise obtained from forests.⁸¹

According to Kautilya every creature has its own role to play in maintaining and preserving the environment. Some animals both carnivorous and herbivorous, aquatic animals as well as animals in the notified areas including the young animals are neither to be caught and killed nor molested. This reveals Kautilya's concern to ensure the preservation of all species. He firmly believed that human beings have no right to use animals for their luxury, because he states that skin, hair, bones and other things are to be collected from dead animals. According to him causing pain or killing animals is a cognizable offence.⁸² For cutting the tender sprouts of trees in city parks bearing fruits and flowers and providing shade, the fine of six panas⁸³ and for cutting small branches and stout branches, it was twelve panas and twenty panas respectively.⁸⁴

⁷⁹ Also consisted of Hindu treatise on statecraft, economic policy and military strategy etc. This book is most secular, realistic and practical in its approach as it was designed to identify the rules and regulation which could be enforced under the law made by emperor. It includes the preservation of environment and ecology.

⁸⁰ Dr. R. Shamasastri, *Kautilya's Arthashastra* pg. 107 (Mysore Printing and Publishing House, Mysore, 7th Edn., 1961).

⁸¹ Kailash Thakur, *Environmental Protection Law and Policy in India* pg. 105 (Deep & Deep Publications Pvt. Ltd., Reprinted, 2007).

⁸² C. Panduranga Bhatta, "Environment Friendly Life Styles: A Dialogue with Ancient India," *Available at:*

https://facultylive.iimcal.ac.in/sites/facultylive.iimcal.ac.in/files/project_doc/Environment%20Friendly%20Life%20Styles%20A%20Dialogue%20with%20Ancient%20India.pdf

⁸³ Silver punch marked coins. Burjor Avari, *India: The Ancient Past: A History of the Indian Subcontinent from 7000 BCE to BCE1200*, (Routledge, 2nd Edn., 2016).

⁸⁴ Shyam Divan & Armin Rosencranz, *Environmental Law and Policy in India* pg. 24 (Oxford University Press, New Delhi, 1st Edn., 2001).

Trees played a considerable part in the administration of ancient Indian kingdoms. The planting of trees has been proclaimed as conducive to great merit. Trees came to be regarded as so important that their felling or deforestation without reason and permission was looked upon as a penal offence. The superintendent of forest was authorized to cause forest produce to be brought in by 'guards in produce-forests'; to establish factories for forest produce and fix adequate fines and compensation for damage to any productive forests. Timber forests and elephant-forests were permitted to be exploited by none other than the ruler. Spies in the guise of traders were entrusted with a duty to ascertain the quantity and price of the royal merchandise obtained from forests.⁸⁵

As regards the protection of wild life, there were prohibition on killing of animal and birds. The officer in charge (Superintendent of the slaughter house), was authorised to impose a fine up to one thousand panas on those who were found guilty of killing deers, birds and fish declared to be under state protection. One-sixth of live animals and birds were required to let off in forests under states protection. Care was taken that animals from reserved parks or protected areas if found grazing in a field, were to be driven out without being hurt or killed, after intimating the forest officer. For causing injury to them, the fine was imposed. Wild life in sanctuaries enjoyed complete protection from being killed except when they turned harmful.⁸⁶

Arthashastra also prescribed punishment for causing pollution and uncivic sanitation. It provided that the officer in charge should punish those who throw dust on the roads by one-eighth pana for causing muddy water one-fourth pana, and if both acts were committed, the punishment should be double. If faecal matter is thrown or cause to be piled up near temple, well or pond, sacred place or state building then the punishment was to increase gradually by one pana in each case. For urinating in such places the punishment prescribed was only half of the above punishments.⁸⁷

The rules for the city administration pronounced by Chanakya testify that the rulers were keen on maintaining hygiene and cleanliness. The civic responsibility and municipal regulations were verses relating to hygiene and damage to property. He

⁸⁵ *Ibid.*

⁸⁶ Kailash Thakur, *Environmental Protection Law and Policy in India* pg. 105 (Deep & Deep Publications Pvt. Ltd., Reprinted, 2007).

⁸⁷ *Ibid.*

dealt in detail and meticulously explicated the various rules for the protection and upgradation of environment. Rules made by Kautilya made it mandatory for the rulers to protect forest and animals. They also prohibited killing or injuring animals and birds. Service penalty was prescribed for the offenders. The Arthashastra provided for punishments against the citizens for violating norms of hygiene as under:⁸⁸

(a) For throwing dirt on the road, the fine shall be one-eighth of a pana and for blocking the same with mud or water the fine shall be onequarter of a pana. {2.36.26}

(b) For the same cause, on the royal highway, such fine shall be double. {2.36.27}

(c) For using a holy place as an urinal, the fine shall be one-half of a pana, as a latrine, one pana; for using a water reservoir as an urinal, the fine shall be one pana, as a latrine, two panas; for using a temple as an urinal, the fine shall be one and one half of a pana, as a latrine, three pana and for using

(d) For throwing dead bodies of animals like cat, dog or serpent inside the city, the fine shall be three panas, and for other animals like donkey, camel, mule, horse or a cattle, the fine imposed shall be six panas and for human dead bodies the fine shall be 50 panas. {2.36.30}.

The end of Gupta Empire in 673 A.D. saw reversion of the environment conservation movement as established in Mauryan era to the situation prior to it. Political instability as caused by local conflicts, division of the country into many small states, foreign invasions led to a great deal of destruction to forests and wild life.

Other Hindu Kings also prohibited killing of animals and destruction of forest. King Ashoka of the Mauryan Empire did as much as he could to protect environment. He made several laws for the preservation of the ecology of India. The ancient Indian king Ashoka is one of the greatest figures in the political history of human kind and his messages recorded in his inscriptions are noteworthy from the point of view of

⁸⁸R. P. Kangle, *The Kautilya Arthashastra-I* pg. 94 (Motilal Benarasidas Publishers Pvt. Ltd., New Delhi, 2nd Edn., 2014).

present-day environmental problems. Ashoka stressed on the ethical teachings of Buddha, self-control and loving service to all living beings. These he popularised throughout his vast empire by engraving them on stone pillars and by illustrating them in his own conduct.

In his dharma policy he gave priority to ahimsa, namely non-violence, non-injury to human beings and animals and abstention from war. Ashoka forbade slaughtering of animals for sacrifices and food and prohibited his court from hunting expeditions on the necessity of treating all living beings with kindness and compassion. He gave importance to ecology and public services in order to avoid unnecessary sufferings to people and animals. Ashoka's dharma aims at universal good and is more humanitarian than a religious movement. His ethics include several elements which de facto effect a reduction of exploitation and destruction of the environment, namely, non-injury to animals, and benevolence and compassion towards all sentient beings. It is stated in the Rock Edit I that: 'No living being should be slaughtered for sacrifice. Many hundreds of thousands of living beings were formerly killed every day in the royal kitchen. But now only three living creatures i.e. two peacocks and one animal are killed for the sake of curry. Even this animal is not regularly killed. These three living beings shall not be slaughtered in the future.'⁸⁹

King Ashoka expressed his view about the welfare of creatures in his State. He gave orders for planting of trees by the roadside for the benefit of travellers. He also issued Adnavapatra to preserve forests and natural water resources. He prescribed various pecuniary punishments for killings animals that include even ants, squirrels, parrots, pigeon, lizards and rats. The Ashoka's edicts (Dhauri, Orissa) especially the 5th pillar edict clearly advocate both restraint in the killing of animals, and cutting of trees and plants. Ashoka also encouraged the planting of trees along highways as well as in parks and gardens.

This reveals Ashoka's concern to ensure the preservation of all species. Further the inscription states that cocks are not to be caponed. Husks containing living beings should not be burnt. Forests should not be burnt without purpose or just to destroy living beings. Living beings must not be fed to living beings. Fish should

⁸⁹ Hemendu Bikash Chowdhury, *Asoka 2300: Jagajjyoti, Asoka Commemoration* pg. 125 (Cosmo Publication, 1997).

neither be killed nor sold on the three days of every three-month period, the full-moon day in the month of Tishya (Jan-Feb), the fourteenth, the fifteenth of every bright fortnight and the first of the dark fortnight in each case and in every fast day. These and other species of animals should not be killed in the forests and the fishermen's localities. It is to be noted here that Tishya also called Pushya was the birth star of Ashoka. Bulls and other animals are not to be castrated on those days, also on the eighth, fourteenth, fifteenth days of the fortnight and on the days of Tishya and Punarvasu, on the three days of every three-monthly period and on every auspicious day. Horses and bullocks should not be branded on those days.⁹⁰

Therefore, it can be said that the ancient Indian environmental philosophy had mainly consisted in the old traditions and injunction contained in various scriptures and smritis. It mainly focuses on the interdependency between living beings and nature and for causing imbalance to the nature or abusing it steps had prescribed for punishments for immediate gains which was considered unjust, irreligious and against environmental ethics. The environmental ethics of nature conservation were not only applicable to common man but the rulers and kings were also bound by them. Despite the injunctions in the scriptures and the preachings of saints, resource conservation was not taken very seriously as the natural resources under a common belief were considered to be inexhaustible and too formidable for man and his tools to need any protection themselves which continued during the subsequent periods also.

4.4 The Medieval Period

The medieval period of India marked the beginning of a new phase i.e. the Sultanate period. Its rulers had almost succeeded in separating the country from the country from which they originally belonged. The Sultanate disintegrated from each other and emerged as a number of independent kingdoms in different parts of the country. Some of these like Bahmani and Vijaynagar kingdoms became very powerful. It consisted of people from Turks, Persi, Mongolia, Afghan etc. who had entered into and settled in India on different periods. In the following work focus has been made on the environmental concern among the people during the Mughal period.

⁹⁰ *Ibid.*

4.4.1 Mughal Period

During this period (1526-1858) environmental conservation had looked into from aesthetic point of view. They were great lovers of nature which can be seen from the significant contribution made by them in protecting the nature and setting up of magnificent gardens, fruit orchards and parks and foliage at different places brought them closer to the ecology. Although we know about the famous Mughal gardens, to which little attention had paid so far, but which clearly brings out their concern of the garden-laying to make greenery accessible to the ordinary man. Abdur Rahim Khan Khanan laid out public gardens at Burhanpur and Ahmadabad; the King himself another one at Ahmadabad; Princess Jahangira at Surat, and so on. The famous Taj Mahal garden too was open to the public⁹¹.

Mughal Emperors also did not pay much attention towards environment conservation although they were the fond lovers of the nature. For Mughal rulers, forests meant no more than wooded lands where they could hunt. The Governors of the forests treated properties as a source of revenue. A few species of trees were specified as royal trees and enjoyed patronage from being cut except upon a fee. There was, however, no restriction on cutting of other trees. In the absence of any protective management, forests during this period shrank steadily in size on account of felling made for cultivation both shifting and settled.⁹²

It is noteworthy that a very little concern was shown by Emperor Babar for the preservation of environment who described the fauna of India in a very systematic style. He used to maintain a diary in which he recorded his love towards natural beauty. After giving the features of India's physical geography he proceeds to describe first the mammals, then birds, and, finally, aquatic animals. He is not only interested in their physical appearance and use for human beings but also in their habitat, food and attributes. His description of birds is of particular interest for ornithologists. He carefully noted the occasion and place when he first saw a bird. He was quite aware of birds' migration. Similarly, while describing trees his remarks are equally insightful,

⁹¹ Shireen Moosvi, "Environmental Concern in Mughal Era" Vol. 1 Journal of History and Social Science pg. 1, (July-December 2010).

⁹² Dr. Indranil Bhattacharjee, *Textbook of Environmental Laws* pg. 107 (Kamal Law House, Calcutta, 1st Edn., 2009).

such as —“It (tamarind) has finely-cut leaflets. It is a very good-looking tree, giving dense shade. It grows wild in masses too”. Or, about latifolia—“most of the wood in houses of Hindustanis is from it.”⁹³ He was always keen to make gardens in all the places where he lived.

During the period of Sher Shah who was popular among other for the construction of Grand Trunk Road in India we find the existence of shady trees for the travellers in both the sides of the road. Much cannot be said regarding Jahangir's interest in animals, birds etc. he was said to grow finest gardens during his period. He cultivated high altitude trees such as cypress, juniper, pine and sandal tree in the plains of India⁹⁴. Jahangir ordered his artists to portray animals and birds as well as prepare accurate paintings of flowers providing all the botanical details necessary for identifying the family of the flower. He commissioned his celebrated artist Mansur to paint the flora of Kashmir; and how carefully this was done may be seen from the painting of a species of tulip (staggeringly minute in detail) that has been preserved at Aligarh.⁹⁵ Such paintings also include different kinds of crows, partridges and sheep.

As regards the position of forest economy, the rural communities by and large, enjoyed untrammelled use of forests and wastes in their vicinity. The waste and forest lands were treated as open access resources. The native rulers, however, did subject and produce of the forests (such as medicinal plants) to a small cess as and when these were exported. The products of the forests conserved by the local people themselves were exempted from cess. Untrammelled use of forests and other natural resources, however, did not mean that they could be used or misused by one and all without any restraints. Rather they were quite effectively managed with the help of a complex range of rules and regulations woven around the socio-cultural features as well as the economic activities of local communities.⁹⁶

⁹³ Pushpa Tiwari, “Environment Concern in Mughal Era,” Vol. 6 Journal of Environment History & Social Science, (Dec. 2015).

⁹⁴ Amirthalingam Murugesan, Journal of Indian History and Culture pg. 184 (2016) Available at: https://www.researchgate.net/publication/314832058_PERSPECTIVES_OF_ENVIRONMENTAL_STUDIES_DURING_THE_MUGHAL_PERIOD (Last visited on April 2, 2017).

⁹⁵ Pushpa Tiwari, “Environment Concern in Mughal Era,” Vol. 6 Journal of Environment History & Social Science, (Dec. 2015).

⁹⁶ Kailash Thakur, *Environmental Protection Law and Policy in India* pg. 107 (Deep & Deep Publications Pvt. Ltd., Reprinted, 2007).

4.4.2 Environment Protection during Colonial Regime

Colonialism in India initiated fundamental changes in the pattern of resource use, notably forests, and has been described by some workers as a 'watershed' in the history of the subcontinent.⁹⁷ With a view to trade in India the British arrived in the year 1600 but finding immense natural resources and to exploit the same, there was strategic change in their plan which resulted into the adoption of coercive method in order to fulfil their aim by employing the policy of imperialism. As a result there was large scale plundering of natural resources especially the forest resources from India due to the fact that there was increasing tendency of commodifying the same. Further to facilitate the maritime expansion, military and navy and the construction of the Indian railway need was felt to cut the forests. Perhaps the most notable resource intensive undertaking by the Britishers was the use of timber in the construction of the Indian railway system. In the fifty years between 1860 and 1910, railway track increased from 1349 Kms to 51,658 Kms (Government of India, 1964). For every mile of track laid, 860 sleepers were required, which had an expected lifespan of approximately 12 to 14 years. In the 1870's, it was calculated that every year one million sleepers were needed. Indian trees, particularly sal, (*Shorea robusta*), deodar, (*Cedrus deodara*) and teak, (*Tectona grandis*) were preferred as sleepers, for their perceived strength over other Indian timbers, so it was these three species that were intensively exploited.⁹⁸

Steps were, however, adopted for the conservation of forests during this period which was mainly based on their interest in hunting. The establishment of Indian forest department in the year 1860 was considered as the colonial world's first and most sophisticated forest department.⁹⁹ The immediate task of the forest department under the supervision of Inspector General was that of exploration of resources, demarcation of reserves, protection of the forest from fire and assessment of the growing stock in valuable reserve by sample enumeration and prescription of yields which could be sustained. The objective of management of forest thus changed from

⁹⁷ M. Gadgil, R. Guha, *This Fissured Land: An Ecological History of India* pg. 113 (Oxford University Press, 1992).

⁹⁸ Joy Lawbuary, "Reclaiming the Forests? People's Participation in Forest Management, East India," Available at: <https://www.ganesha.co.uk/JoPubWeb/Frontdiss.htm> (Last visited on May 15, 2017).

⁹⁹ Joachim Rajkau, *Nature and Power: A Global History of Environment* pg. 174 (Cambridge University Press, New York, 1st Edn., 2008).

obtaining of timber for various purposes to protecting and improving forests and treating them as a biological growing entity¹⁰⁰.

For the effective functioning of this department, legislations were enacted to curtail the rights of the indigenous communities. The early attempt at asserting state monopoly was brought through the Indian Forest Act of 1865,¹⁰¹ which was replaced by the Indian Forest Act, 1878 to remove the ambiguity with respect to state proprietary rights over forests.

The Indian Forest Act of 1878 established that customary use of forest by the villagers was based not on “right” but on “privilege” and this privilege was at the mercy of local rulers and now Britishers being the ruler were the repository of same privilege. The Act on one hand, allowed the usurpation of the forest by the state without any legal settlement of rights by “reserving” the certain blocks of forest for sustained timber production for “colonisers commercial interests by limiting the customary rights of users (village community) and on the other hand, through forest settlement operations specified the extent and limits of rights in particular blocks where villagers’ rights could be exercised.¹⁰²

This was done through the classification of forest in three type viz. Reserved Forests, Protected Forests and Village Forests. Reserved Forests were established with the intention to provide ecological stability and maintain the supplies of commercial timber which British strategic and developmental goals required especially in areas with large compact stands of commercially valuable species that could sustain long term exploitation. Here the exploitation of forest by local population was restrained.

The Protected Forests were demarcated and covered with working plans. In these access was reserved to commercially valuable trees and restrictions were imposed on activities like grazing.

¹⁰⁰ Kailash Thakur, *Environmental Protection Law and Policy in India* pg. 109 (Deep & Deep Publications Pvt. Ltd., Reprinted, 2007).

¹⁰¹ The law allowed officials to manage and preserve forest resources for strategic and development needs by regulating trade and exploitation of forest products.

¹⁰² Ramachandra Guha, “Scientific Forestry and Social Change in Uttarakhand” *Economic and Political Weekly* pg. 20 (Nov., 1985) .

Under the third category *i.e.* the Village Forests, the full governing power had been assigned to village authorities by the state government.¹⁰³

However, the British government also made attempts to regulate various kinds of air, water and noise pollution in India. Some of the Acts were The Shore Nuisance (Bombay & Kolaba) Act, 1853, which was one of the earliest laws concerning water pollution. The Oriental Gas Company Act, 1857 was enacted to regulate pollution produced by Oriental Gas Company by imposing fines. The next and most important enactment was The Indian Penal Code, 1860, and it was enacted to be a complete Criminal Code.

For the protection of wild life, some legislation had passed which were confined to specific areas and species. In 1873, Madras enacted the first legislation on wild life for the protection of wild elephants. Later on, the Elephants Preservation Act, 1879, Wild Birds and Animals Protection Act, 1912 had introduced the practice of closed hunting seasons, bag limits and permits. It also established wild life preserves in Kaziranga in 1926 and Hailey National Park in 1936¹⁰⁴.

The earliest enactments during British rule to control air pollution were the Bengal Smoke Nuisance Act, 1905 and Bombay Smoke Nuisance Act, 1912. In addition, The Police Act, 1861 prevents and controls the slaughtering of animals, cleaning of carcass, throwing dirt into streets and also prescribes punishments for the offenders in the nature of fines. The Indian Easement Act, 1882 protected the riparian owner against unreasonable pollution by upstream user. The Indian Fisheries Act, 1897 penalised the killing of fish by poisoning water by using explosives. However, the objective of environment policy during this period was different *i.e.* was not directed at the conservation of the nature but it was directed at exploitation of common resources with a primary objective of earning revenue.

These Acts and several other Acts that have been enacted by the British Legislature from time to time till independence marked the beginning of new era in

¹⁰³ Richard Haeuber, "Indian Forestry Policy in Two Eras: Continuity or Change"? Environmental History Review pg. 17(1993).

¹⁰⁴ Kailash Thakur, *Environmental Protection Law and Policy in India* pg. 111 (Deep & Deep Publications Pvt. Ltd., Reprinted, 2007).

the realm of environment protection. In the following chapter, an attempt has been made, to discuss in brief, several Acts which have direct and indirect impact on the environment. Such Acts aimed at regulatory measures with a view to preserve and protect the environment.

4.5 An Overview

To trace the bio-medical issues during the historical past is not easy. The various ancient texts, scriptures that has highlighted on the environmental aspects right from the ancient period till the advent of the British rule in India, none of such documents have specifically dealt with the subject. This is perhaps due to the reason that during the different phases of environment development in the country, the experts were concerned more on the question of how the preservation and maintenance of the nature could be made rather than finding the answer of the very question on what were the different human activities which added peril to the nature. Moreover, the past ancient history had focused more on the man and nature relationship and their interdependency. Most of the religious texts had highlighted mainly on the point that nature should not be destroyed. There is hardly any text which had prescribed that human being should be prevented from doing such act that caused danger to it. Indian past civilisations also depicted more or less the similar picture. It was during the British reign in India, concern for the specific environmental issues had been handled under different laws passed by them. None of the Acts had consisted of provisions relating to the bio-medical waste. Therefore, the quest for the law on the subject continues in the following chapters.

CHAPTER V

CONSTITUTIONAL DOMAIN FOR THE MANAGEMENT OF BIO - MEDICAL WASTE

The culture of tolerance, non-violence which India has been enjoying and maintaining since ancient time has become part and parcel in the daily life of the people when the same has been synthesised with religion. It has been the belief of human kind that air, water, land, animals, plants and human being were considered as the creation of one superior power i.e. the God. The religious influence (as seen in the previous chapter) coupled with the social and political norms and economic policies made it clear that man is a part of nature that exists collaterally with it and are dependent on each other but is not superior in any way. Therefore, to live in harmony with the nature has become the fundamental ethics of human beings because it was well realised that destruction or damage to one is nothing but the destruction of self. Each one is complimentary to each other. Such interdependency, cooperative living and close association implies that one is complimentary to each other and is the real basis of human life. It became a sacred duty of human being to behave rationally and protect the nature. Wisdom of Vedas religious principles of Hindus and moral doctrine taught the lesson of co-existence between man and his environment through which later on became a part of the daily life of people¹. However, this does not mean that nature has never been the subject of exploitation in the hand of human being. The environment history of all countries of the world has shown the destruction of nature to fulfil human needs and comforts. This is inevitable and cannot be avoided. The economic development, which has been the prime importance of any country give rise to the necessity of taking the help and depending on the nature because without effecting the nature the so-called development is a misnomer. Therefore, in order to save the nature from human exploitation every country should come forward with fundamental Constitutional provisions to safeguard the nature *vis-a-vis* the environment from human encroachment.

The philosophy of such peaceful co-existence with the nature and sustainable development got verbatim in one way or another in Indian Constitution. The

¹ R. B. Singh and Suresh Misra, *Environmental Law in India: issues and Responses* pg. 102 (Concept Publishing Company, 1st Edn., 1996).

Independence of India in 1947 and the framing of the Indian Constitution in 1950 helped the nation to concentrate in activities related to economic development and greater emphasis was given on agriculture produce and industrialisation. Use of fertilisers, insecticides, pesticides was on increase and heavy industries in the field of steels, fertilisers, petroleum refining, ferrous and non-ferrous metals, mining heavy chemicals etc. were established. Numerous ancillary units followed. Industrialisation and economic upliftment give rise to problems of urbanisation, public health and others². The environmental issues in today's industrial society has become so serious and complicated that it constantly threatening the very existence of life which demanded an immediate solution to these problems and this can be met with the help of constitutional provisions. The Constitution of India also contained detailed provisions relating to protection and preservation of human environment which have been discussed hereinafter below.

The Constitution of India is the fountain head of power and authority and all other laws derive their force from it. The Constitution, being the fundamental law of the land has a binding force on citizens, non – citizens as well as on the State. Our Constitution is amongst the few and is the first Constitution³ in the world that contains specific provisions on environment protection. On the basis of such provisions various laws have been enacted for the protection of environment relating to flora and fauna. Although the idea for the protection of the environment had not been there in the minds of the founding father when the original provisions of the Indian Constitution were debated and approved in the Constitutional Assembly. However, the seeds of specific provisions on environment protection could be found in Article 47⁴ of the Directive Principles of State Policy (DPSP) and the Chapter which deals with Centre-State relationship⁵.

² Nosrat Ganjali, Masume Hafez Reza Zadeh *et. al.*, “An investigation on the participation rate of women in the urban environmental conservation” Vol. 3 Journal of Novel Applied Science pg. 303 (2014).

³ P.S. Jaswal and Nishta Jaswal, *Environmental Law* pg. 40 (Allahabad Law Agency, Faridabad, 3rd Edn., 2009).

⁴ The Article reads: “The State shall regard the raising of the level of nutrition and standard of living of its people and improvement of public health as among its primary duties and, in particular, the State shall endeavour to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health”.

⁵ Articles 245-286 of the Constitution of India.

Although these provisions incorporated the environmental issues in a formal way but the true efforts for the protection of environment began only after the Stockholm Conference held in June, 1972. Before this Conference, neither the Constitution nor any laws had expressly dealt with the problem of environment. It was only after this Conference that both constitutional and legislative reforms have been given effect to in India to meet and combat the environmental problems in the country⁶. Showing concern regarding the growing menace of the environment pollution in the Stockholm Conference the then Prime Minister of India Mrs. Indira Gandhi while displaying the nation's commitment to the protection of environment emphasised that,

“...for the developed countries development might be the cause of destructions of environment. For a country like India, it was a primary means for improving the standard of living to make available the food products, water, cleanliness, shelter, to bring about greenery in deserts and to make hills and mountains worth living”⁷.

The natural resources of the earth, including the air, water, land, flora and fauna and especially representative sample of the nature ecosystem must be safeguard for the benefits of present and future generations through careful planning or management. Nature conservation including wildlife must therefore receive importance in planning for economic development⁸. Therefore, to comply with the principles of the Stockholm Declarations adopted in the International Conference on Human Environment, the Government of India, by the Constitution Forty-Second (Amendment) Act, 1976 inserted Articles 48-A⁹ and 51-A(g)¹⁰ for the protection and promotion of the environment which form part of the DPSP and the Fundamental Duties respectively. The amendment, coupled with the Indian higher judiciary's innovative approach to the inter-relation of the constitutional provisions, has been the chief source of the development of environmental jurisprudence in India. It may be

⁶ Aruna Venkat, *Environmental Law and Policy* pg. 52 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

⁷ S. K. Kapoor, *International Law* pg. 390 (Central Law Agency, Allahabad, 8th Edn., 2002).

⁸ Principle 2 of the Stockholm Declaration, 1972.

⁹ Article 48-A of the Constitution of India reads as follows: “The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country”.

¹⁰ Article 51-A(g) of the Constitution of India reads as follows: “It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures”.

appreciated that the Apex Court's liberal, innovative and dynamic interpretation of Articles 12, 14, 19, 21, 32, 48A, 51A(g), 136, 142, 144 and 226 of the Indian Constitution has been the cornerstone of the structure of the environmental jurisprudence in India¹¹. Apart from the above mentioned provisions the Indian Constitution contained various provisions relating to the environment that pervaded under different parts which can be better understood under the following heads:

1. The Preamble
2. Fundamental Rights
3. Directive Principles of State Policy (DPSP)
4. Fundamental Duties
5. Legislative Relations (Centre-State Relations)

5.1 The Preamble

The Preamble, no doubt, is not a specific provision of the Constitution, and yet is an important component as it defines the overall ethos, framework, goals, objectives and commitments of the people of India from a long historical perspective. In a sense, the specific provisions that follow as Articles are supposed to flow from and are operational on the basis of the general principles stated in the Preamble. All the broad principles enunciated in it have an indirect bearing on environment and thereby on health.

The wording of the Preamble highlights some of the fundamental values and guiding principles on which the Constitution of India is based. The Preamble plays pivotal role when there is ambiguity in provisions of any Article or interpretation becomes confusing. This is when the spirit of the Preamble becomes the guiding factor. The Preamble is stem, root and source of the Constitution. Chief Justice R.C. Lahoti in *P.A. Inamdar v. State of Maharashtra*¹² has highlighted the importance of the preamble in the following words:

“It is well accepted by thinkers, philosophers and academicians that if Justice, Liberty, Equality and Fraternity, including Social, Economic and Political

¹¹Aruna Venkat, *Environmental Law and Policy* pg. 52 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

¹²(2005) 6 SCC 537.

Justice, the golden goals set out in the preamble to the Constitution, are to be achieved; the Indian polity has to be educated and educated with excellence. Education is a national wealth which must be distributed equally and widely, as far as possible, in the interest of creating an egalitarian society, to enable the country to rise high and face global competition¹³”.

The Preamble to the Constitution of India envisages the creation of a welfare state¹⁴. It declares India as a “Socialist” country, and this term itself gives a substantial proof of the existence of social welfare responsibilities of the government where the State pays more attention to the social problems than on any individual problems. Environmental pollution which has emerged as one of the biggest social problems is being regarded as a real problem affecting the society at large and thus state is under an obligation to fulfil the basic aim of socialism, that is, to provide decent standard of living to all which can be possible from a pollution free environment¹⁵. In this connection the observation made by the Hon’ble Supreme Court in the case of *D. S. Nakara v Union of India*¹⁶ deserve special mention when it says-

“The principal aim of a socialist State is to eliminate inequality in income and status, and standard of life. The basic frame work of socialism is to provide a decent standard of life to the working people and especially provide security from cradle to grave”¹⁷.

Such standard of life would mean to lead a life without any ill effect on health and this would only be possible in an environment which is pollution free. It assures dignity of individual, which along with other attributes also includes living in a quality environment. Therefore, it is the duty of the State to provide an environment whereby people can live peacefully in a pollution free environment which is the fundamental right of each and every citizen as per the Indian Constitution. This in turn would help the citizen of India to have an endeavour for the attainment of dignity

¹³ *Ibid* at pg. 588.

¹⁴ Ruchi Pant, “From Communities’ Hands to MNCs’ BOOTS: A Case Study from India on Right to Water”, Right and Unity, UK, Available at: http://www.righttowater.info/wp-content/uploads/india_cs.pdf (Last visited on Oct. 5, 2015).

¹⁵ Dr.Sukanta K.Nanda, *Environmental Law* pg. 65 (Central Law Publication, Allahabad, 1st ed., 2007).

¹⁶ AIR 1983 SC 130.

¹⁷ *Ibid* at pg. 139.

of life. Clean, neat, free and unpolluted environment certainly helps in maintaining and attaining dignity¹⁸. The Constitution makes it mandatory to protect, promote the concept of life and personal liberty and to assure every citizen a decent standard of living. It makes a strong commitment towards promoting the well-being of all citizens. The Constitution Forty-Second (Amendment) Act, 1976, by inserting words “Socialistic Secular” in the Preamble has made it amply clear the nature and pattern that the Indian society shall endeavour to accomplish.

The Preamble of the Constitution clearly demonstrates that the socio-economic justice was the foundation of it. Environmental justice however, does not find a place in the body of the Preamble along with other justice. The original resolution to constitute India into a Sovereign, Democratic Republic was modified by the Forty-Second Amendment of 1976 which made India a Sovereign, Socialist Secular, and Democratic Republic¹⁹. The importance of this amendment can easily be visualised. The amendment imposes a number of new obligations on the State. The State has been conferred with the responsibility to eliminate all sorts of social evils which poses environmental risks and causes dangers to the living beings. Therefore, providing social justice to every citizen of the country is the main responsibility on the part of the government. The problem of environmental pollution is social problem affecting the society at large and is increasing in nature. Hence measures are required to be adopted within the Constitutional framework and the same can be achieved with the help of the preamble whenever confusion arises with regard to the interpretation of the provisions of the Constitution relating to environment pollution.

5.2 Fundamental Rights

An overview of Part III of the Constitution of India entitled, “Fundamental Rights” (Articles 12-35)²⁰ makes it clear that there were no explicit provision in favour of environment or pollution control. However, in course of time, Indian Courts have contributed significantly by broadening the contents and contours of some of

¹⁸ N. S. Tiwana, *Environment Pollution and Protection* pg. 258 (Deep & Deep Publication Pvt. Ltd., New Delhi, 4th Edn., 2006).

¹⁹ The Constitution (Forty-Second Amendment) Act, 1976.

²⁰ Such as right to equality, right to freedom, right against exploitation, right to freedom of religion, cultural and educational rights and rights to constitutional remedies.

these basic rights²¹ because according to the Apex Court these fundamental rights represent the basic values cherished by the people of this country since Vedic times and they are calculated to protect the dignity of the individual and create conditions in which every human being can develop his personality to the fullest extent. To examine this perspective from environmental point of view an analysis of Articles 14, 19 and 21 has been made herein below.

5.2.1 Right to Equality

Article 14²² is the principle instrument to strike at the arbitrary action by the State if there is a negation of the right to equality. Such arbitrary action by the State may have an adverse impact on the environment where permissions had granted, for instance, for the construction, in violation of the development regulations or for mining without evaluating the public interest and without application of mind and considering the environmental consequences. Thus, we find that Article 14 can be used as a potent weapon against governmental decisions threatening the environment. The Apex Court, on various occasions, have struck down the arbitrary official sanction in environmental matters on the basis that it was violative of Article 14.

For example, in *State of Himachal Pradesh v. Ganesh Wood Products*²³ the Supreme Court held that a decision making authority must give due weight and regard to ecological factors such as the environmental policy of the government and the sustainable use of natural resources. A government decision that fails to take into account relevant consideration affecting the environment is invalid.

Article 14 has been invoked in *Kinkri Devi and Another v. State of Himachal Pradesh and Ors.*²⁴, which involves indiscriminate grant of mining leases and the unchecked and unscientific exploitation of the mines by the lessees, especially in the hilly tracts and the regions of the Himalaya which in all likelihood, might result in evil consequences having a far reaching and lasting impact on natural wealth, the resources of the country and the local population. It is alleged that the government

²¹ Dr. Surendra Kumar, *Environmental Protection* pg. 64 (Northern Book Center, New Delhi, 1st Edn., 2009).

²² Article 14 of the Constitution of India states that the State shall not deny to any person equality before law and equal protection of the laws within the territory of India.

²³ AIR 1996 SC 149.

²⁴ AIR 1987 HP 4.

arbitrarily granted the permission for mining activities without adequate consideration of environmental impact which amounts to violation of Article 14.

Similarly, in *Mandu Distilleries Pvt. Ltd. v. M.P. Pradushan Niwaran Mandal*²⁵ the Pollution Control Board issued direction for stoppage of production by the industry on the ground that it was causing water pollution. However, the Court found that there was serious flaw in “decision making process”. The decision was taken arbitrarily. The Court quashed the order passed by the board as violative Article 14 of the Constitution.

In *Bangalore Medical Trust v. B.S Muddappa*²⁶ the Supreme Court prevented an attempt to convert a public park site into nursing home. The City Improvement Board of Bangalore had prepared the Development scheme for the extension of the City of Bangalore. Under the scheme an area was kept for being developed as low Level Park. Subsequently, under the direction of the Chief Minister of the State the area kept for laying a park was converted to a civic amenity site where hospital was to be constructed by the appellant. When the construction activity was noticed, the resident of the area approached the High Court which allowed the petition. The Appellant contended that the decision to allot a site for a hospital rather than a park is matter within the discretion of the development authority and thus, the diversion of the user of the land for that purpose is justified under the Act. The Supreme Court dismissed the appeal and highlighted the importance of public parks and open space in Urban Development in the following words:

“Protection of the environment, open spaces for recreation and fresh air, play grounds for children and other conveniences are matters of great public concern and are vital interest to be taken care of in a development scheme. The public interest in the reservation and preservation of open spaces for parks and playgrounds cannot be sacrificed by leasing or selling such sites to private persons for conversion to some other user; it would be in direct conflict with the Constitutional mandate²⁷”.

²⁵ AIR 1995 MP 57.

²⁶ (1991) 4 SCC 54.

²⁷ *Ibid* at pg. 63.

In *D.D. Vyas v. Ghaziabad Development Authority*²⁸ the grievance of the petitioner is that the respondents had not taken any steps to develop the area reserved for park. On the other hand, respondents were marking time to carve out plots on such open space dedicated for Public Park in the plan and alienate the same with a view to earning huge profits. The Allahabad High Court followed the dictum of the Supreme Court in Bangalore Medical Trust case and held that the authority or the State cannot amend the plan in such a way so as to destroy its basic feature allowing the conversion of open spaces meant for Public Park. The Court was of the view that the respondents having failed to develop the park, have reminded grossly negligent in discharging their fundamental duty under Article 51-A (g) of the Constitution.

Therefore, by applying this Article in environmental issues it can be said that man has the fundamental right to freedom, equality and adequate conditions of life, in environment of a quality that permits a life of dignity and well being²⁹.

5.2.2 Freedom of Speech and Expression and of Trade and Business

The environmental issues that are part of Directive Principles of State Policy may also be enlightened under Article 19(1) (a) that guarantees to every citizen a fundamental freedom of speech and expression. The prerequisite for enjoying such right is knowledge and information and the absence of authentic information on matters of public interest including the environment matters will only gives rise to more confusion. Proper information based on adequate data on environment pollution would help in tackling the problem appropriately under this Article. Most of the environmental jurisprudence in India that has developed by judicial activism was made attracting the attention of the government under the purview of this Article. A public spirited person has the right to inform the judiciary cases concerning environment through letters written or otherwise and the court may by widening the scope of *locus standi* direct the government and the violator to take appropriate steps to stop the same. Such right to inform and to be informed is possible under Article 19(1) (a) which also includes freedom of press because in India the public opinion and media have played an important role in moulding the public perception on environmental issues.

²⁸ AIR 1993 All 57.

²⁹ As stated in Principle I of The Stockholm Declaration, 1972.

Article 19 (1) (a) read with Article 21 of the Constitution guarantees right to decent environment and right to live peacefully. In *P. A. Jacob v. The Superintendent of Police, Kottayam*,³⁰ the Kerala High Court held that freedom of speech under article 19 (1)(a) does not include freedom to use loud speakers or sound amplifiers. Thus, noise pollution caused by the loud speakers can be controlled under article 19 (1)(a) of the constitution.

Apart from the right to speech and expression Article 19 (1) (g)³¹ is also important from the environment point of view. The pollution is mainly from trade and industries. For example, tanneries, acid factories, dye factories, distilleries, hotel industries are contributing to environmental pollution. There is a growing problem of balancing the right to development and right to clean and healthy environment. Article 19 (1) (g) of the Indian Constitution guaranteed freedom of trade and commerce but at the same time it states that this right is subject to reasonable restrictions³². Some of the trades or businesses are carried on in manners which endanger vegetation cover, animals, aquatic life and human health. Any business or trade which is offensive to flora and fauna or human beings cannot be permitted to be carried on in the name of fundamental right.

A citizen cannot carry on business activity, if it is health hazards to the society or general public. Thus safeguards for environment protection are inherent in this. The Supreme Court, while deciding the matter relating to carrying on trade of liquor in *Cooverjee B. Bharucha v. Excise commissioner, Ajmer*³³ observed that, if there is clash between environmental protection and right to freedom of trade and occupation, the courts have to balance environmental interests with the fundamental rights to carry on any occupations.

In *Burrabazar Fire Works Dealers Association and Ors. v. The Commissioner of Police and Ors*³⁴ the Calcutta High Court held that Article 19(1) (g) of the Constitution of India does not guarantee the fundamental right to carry on trade or

³⁰ AIR 1993 Ker 1.

³¹ Article 19 (1)(g) of the Constitution of India guarantees to every citizens of India the right to practice any profession, or to carry out on any occupation, trade or business. This right is, however, subject to reasonable restrictions.

³² Article 19 (6) of the Constitution of India.

³³ AIR 1954 SC 220.

³⁴ AIR1998 Cal 21.

business which creates pollution or which takes away that communities safety, health and peace. The Court is of the view that there is no inherent or fundamental right in a citizen to manufacture, sell and deal with fireworks which will create sound beyond permissible limit and which will generate pollution which would endanger the health and the public order. A citizen or people cannot be made a captive listener to hear the tremendous sounds caused by bursting out from noisy fireworks. It may give pleasure to one or two persons who burst it but others have to be a captive listener whose fundamental rights guaranteed under Article 19(1)(a) and other provisions of the Constitution are taken away, suspended and made meaningless.

In *Abhilash Textiles v. Rajkot Municipal Corporation*³⁵ the Gujarat High Court dealt while delivering judgement on the question whether discharging dirty water from the factory on the public road and public drainage without purifying the same causing damage to public health can be allowed on the ground that Article 19(1)(g) of the Constitution which confers right upon every citizen to carry on any trade or business held that the right is subject to reasonable restrictions which may be imposed in the interest of the general public. Therefore, no one has a right to carry on a business so as to cause nuisance to the society. Similarly, the business cannot be carried in the manner by which the business activity would become a health hazard to the entire society. The court held that the petitioners cannot be permitted to reap profits at the cost of the public health as they had no right to carry on their businesses without complying with the requirement of the law.

5.2.3 Right to life and Personal Liberty

Preservation of human life is a paramount importance. The word ‘life’ in Article 21³⁶ is a key to the judiciary to interpret and is also a key to an individual to protect environment under the guise of this word. This right has been held to be the heart of the Constitution, the most organic and progressive provision in our living constitution, the foundation of our laws. Accordingly, environmental pollution which spoils the atmosphere and thereby affects the life and health of the person has been regarded as amounting to violation of Article 21. The Court in various cases while

³⁵AIR 1988 Guj 57.

³⁶Article 21 of the Constitution of India states-“No person shall be deprived of his life and personal liberty except according to procedure established by law”.

expanding the horizon of the scope the Article 21 included the environmental issues also. In fact, the judicial activism in protecting and safeguarding the natural environment follows from the international commitments made by India in Stockholm Conference of 1972 to the Rio earth summit of 1992, and thereafter, the concept of sustainable development which is a reflection of such commitment has come to be accepted as a viable concept to eradicate poverty and improve the quality of human life while living within the caring capacity of the supporting eco-system. It balances development with ecology, and ensures intergeneration equity³⁷. The Directive Principles of State Policy and the Fundamental Duties Chapters which explicitly enunciate the national commitment to protect and improve the environment³⁸ has found its platform under Article 21 in the hand of our judiciary.

The Supreme Court while interpreting Article 21 in Part III of the Constitution of India observed in various cases that right to life includes within its purview, a catena of rights viz. right to live with human dignity and a life which is to be lived in a proper environment, free of danger of disease and infection, to live in hygienic conditions and so on³⁹. No justification is needed here because no one can lead a healthy life without a healthy and hygienic environment. Not only this, it has been asserted that right to live in healthy environment is the ‘sanctum sanctorum’ of human rights also⁴⁰. Right to life is natural life, logically links the setting of human rights to nature. Consequently, instead of the conventional human-to-human approach human-to-nature conception becomes a dynamic instrument of sustainable development with justice. The concept of right to life, which was in a way, judicially neglected till 1981, and which was suddenly come to occupy the position of “brooding omnipresence” in the scheme of fundamental rights, has been infused with the dynamic concept of human dignity which is the foundation of all other human rights including the right to decent environment⁴¹.

³⁷ P. Ishwara Bhat, *Fundamental Rights: A Study of their Interrelationship* pg. 298 (Eastern Law House, New Delhi, 1st Edn., 2004).

³⁸ Aruna Venkat, *Environmental Law and Policy* pgs. 50-51 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

³⁹ P. S. Jaswal, *Environmental law* pg. 48 (Pioneer Publication, Faridabad, 2nd Edn., 2003).

⁴⁰ Manmohan Singh Gill and Jasleen Kewlani, *Environmental Conscience: Socio-Legal and Judicial Paradigm* pg. 218 (Concept Publishing Company, New Delhi, 1st Edn., 2009).

⁴¹ Aruna Venkat, *Environmental Law and Policy* pg. 55 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

In fact, this right to live with human dignity enshrined in Article 21 derives its life breath from the Directive Principles of State Policy and particularly Clauses (e) and (f) of Article 39 and Articles 41 and 42 and at the least, therefore, it must include protection of the health and opportunities and facilities for children to develop in a healthy manner, just and humane conditions of work etc. These are the minimum requirements which must exist in order to enable a person to live with human dignity and no State neither the Central Government nor any State Government has the right to take any action which will deprive a person of the enjoyment of these basic essentials.

In this connection the observation made by Justice Jagannatha Rao in *A.P. Pollution Control Board v. Prof. M. V. Nayudu*⁴² deserve special mention when he says that the environmental concerns were as important as the human rights concerns as both were founded on Article 21 which guaranteed the fundamental right to life and personal liberty. According to his Lordship, “While environmental aspects concern ‘Life’, human rights aspects concern ‘Liberty’”. His Lordship further declared that, in the context of the emerging environmental jurisprudence, it was the duty of the Court to render justice by taking all aspects into considerations. The court held that “healthy environment” and “sustainable development” were fundamental rights implicit in the right to life. The Court also held that “in today’s emerging jurisprudence, environmental right, which encompasses a group of collective rights, is described as ‘third generation rights’⁴³”.

The right to life guaranteed in Article 21 embraces the protection and preservation of nature’s gift. In tune with this trend, Justice Bhagwati while elucidating the importance of this right observed in *Francis Coralie v. Union Territory of Delhi*⁴⁴:

“The right to life enshrined in Article 21 cannot be restricted to mere animal existence. It means something more than just physical survival. The right to life includes the right to live with human dignity and all that goes with it, namely, the bare necessities of life such as adequate nutrition, clothing and

⁴² AIR 1999 SC 812.

⁴³ *Ibid* at pg. 825.

⁴⁴ AIR 1981 SC 746.

shelter over the head and facilities for writing and expressing oneself in diverse forms with fellow human beings. Of course, the magnitude and contents of the components of this right would depend upon the extent of the economic development of the country but it must, in any view of the matter include the right to basic necessities of life⁴⁵”.

*In Re Noise Pollution-Implementation of Laws for Restricting Use of Loudspeakers and High Volume Producing Sound Systems with Forum, Prevention of Environment and Sound Pollution v. Union of India*⁴⁶, Chief Justice R. C. Lahoti, speaking for the Court in the context of a Writ petition seeking strict implementation of laws pertaining to anti-noise and sound pollution observed:

“It (Article 21) guarantees a right to every person to live with human dignity. Therein are included, all the aspects of life which go to make a person’s life meaningful, complete and worth-living. The human life has its charm and there is no reason why the life should not be enjoyed along with all permissible pleasure. Anyone who wishes to live with peace, comfort and quiet within his house has a right to prevent the noise as pollutant reaching him. No one can claim a right to create noise even in his own premises which would travel beyond his precincts and cause nuisance to neighbours and others.....If any one increases his volume of speech and that too with the assistance of artificial devices so as to compulsorily expose unwilling persons to hear a noise raised to unpleasant and obnoxious levels, then the person speaking is violating the right of other to a peaceful, comfortable and pollution free, life guaranteed by Article 21⁴⁷”.

The right to life as guaranteed by Article 21 of the Constitution is basic human right and the concept of right to life and personal liberty have been transformed into positive rights by active judicial interpretation. A new era had ushered in the post *Maneka*⁴⁸ period where the concept of right to life had witnessed new developments and new dimensions in interpreting the fundamental rights embodied in Article 21. Prior to this all the fundamental rights guaranteed in Part III of the Constitution were

⁴⁵ *Ibid* at pg. 753.

⁴⁶(2005) 5 SCC 733.

⁴⁷ *Ibid* at pg. 745.

⁴⁸ *Maneka Gandhi v. Union of India*, AIR 1978 SC 597.

considered to negative in nature and imposing only negative obligation on the State⁴⁹. For the first time the Supreme Court in the *Maneka Gandhi v. Union of India*⁵⁰ transformed these rights into positive rights and imposed an affirmative duty on the State to enforce it.

On the basis of the wider interpretation to the right to life in Article 21 of the Constitution of India, there has been catena of cases where the Supreme Court and High Courts in the country have held that the right to pollution-free environment is part of the right to life. The first case where the Supreme Court recognised the right to clean environment, as an aspect of the right to life is *Rural Litigation and Entitlement Kendra v. State of U.P.*⁵¹ In this case, the relevant issue for the purpose of our discussion was whether limestone-mining activities in the Mussoorie-Dehradun region caused ecological disturbance and, thus, violated the right to life of the people in that region. The Supreme Court declared that these activities polluted the environment and, thus, violated the right to life of the people. While ordering the closure of some of the limestone quarries, the Supreme Court implicitly read the right to clean environment in the right to life. Without referring to Article 21 of the Constitution, the Apex Court observed:

“This would undoubtedly cause hardship to them, but it is a price that has to be paid for protecting and safeguarding the right of the people to live in healthy environment with minimal disturbance of ecological balance and without avoidable hazard to them and to their cattle, homes and agricultural land and undue affection of air, water and environment⁵²”.

Similarly, in *Charan Lal Sahu v. Union of India*⁵³, in his concurring opinion Justice K.N. Singh observed:

“In the context of our national dimensions of human rights, right to life, liberty, pollution free air and water is guaranteed by Constitution under

⁴⁹ R.P. Anand, R. Khan, *et.al.*, *Law, Science and Environment* pg. 189 (Lancers Books, New Delhi, 1st Edn.,1987).

⁵⁰ AIR 1978 SC 597.

⁵¹ AIR 1985 SC 652.

⁵² *Ibid* at pg. 656.

⁵³ AIR 1990 SC 1480.

Articles 21, 48A and 51A(g), it is the duty of the State to take effective steps to protect the guaranteed constitutional rights⁵⁴”.

Again, in *Subhash Kumar v. State of Bihar*⁵⁵ Justice K. N. Singh declared:

“Right to live is a fundamental right under Article 21 of the Constitution and it includes the right to enjoyment of pollution-free water and air for full enjoyment of life. If anything endangers or impairs that quality of life in derogation of laws, a citizen has right to have recourse to Article 32 of the Constitution for removing the pollution of water or air which may be detrimental to the quality of life⁵⁶”.

In *Virender Gaur v. State of Haryana*⁵⁷, the Court reiterating the view enunciated in the *Subhash Kumar* case stated,

“Article 21 protects Right to Life as a fundamental right. Enjoyment of the life and its attainment including the right to life with human dignity encompasses within its ambit, the protection and preservation of environment, ecological balance free from pollution of air and water, sanitation without which life cannot be enjoyed. Any contra acts or actions would cause environmental pollution. Environmental, ecological, air, water pollution, etc. should be regarded as amounting to violation of Article 21. Therefore, hygienic environment is an integral part of right of healthy life and it would be impossible to live with human dignity without a human and healthy environment.....Therefore, there is a constitutional imperative on the State Government.....not only to ensure and safeguard proper environment but also an imperative duty to take adequate measures to promote, protect and improve both man-made and the natural environment⁵⁸”.

⁵⁴ *Ibid* at pg. 1551.

⁵⁵ AIR 1991 SC 420.

⁵⁶ *Ibid* at pg. 420.

⁵⁷ (1995) 2 SCC 577.

⁵⁸ *Ibid* at pg. 578.

A clarion call was given by the Andhra Pradesh High Court when in monumental judgment of *T. Damodhar Rao v. The Special Officer Municipal Corporation, Hyderabad*⁵⁹, it is observed:

“It would be reasonable to hold that the enjoyment of life and its attainment and fulfillment guaranteed by Article 21 of the Constitution embraces the protection and preservation of nature's gifts without (which) life cannot be enjoyed. There can be no reason why practice of violent extinguishment of life alone should be regarded as violative of Article 21 of the Constitution. The slow poisoning by the polluted atmosphere caused by environmental pollution and spoliation should also be regarded as amounting to violation of Article 21 of the Constitution⁶⁰”.

In *F.K. Hussain v. Union of India*⁶¹, the Kerala High Court pointed out that the right to sweet water and the right to free air are attributes of the right of life, for, those are the basic elements which sustain the life itself.

In *Rajiv Ranjan Singh v. State of Bihar*⁶², it was held by the Patna High Court that failure to protect the inhabitants of the locality from the poisonous and highly injurious effects of the distillery's effluents and fumes amounted to an infringement of the inhabitants' rights guaranteed under Arts. 14, 21 read with Articles 47 and 48-A of the Constitution of India. The Court further directed in this case that in case it comes to light that any person has contracted any ailment the cause of which can be directly related to the effluent discharged by the distillery, the company shall have to bear all expenses of his treatment and the question of awarding suitable compensation to the victim may also be considered.

Yet in another case⁶³, it was held that right to live with human dignity is the fundamental right of every Indian citizen and, therefore, in the discharge of its responsibilities to people, State has to provide at least minimum conditions ensuring human dignity. Accordingly, the Court directed that there must be separate sewage line from which the filthy water may flow out. The drainage must be covered and

⁵⁹ AIR 1987 AP 171.

⁶⁰ *Ibid* at pg. 172.

⁶¹ AIR 1990 Ker 321.

⁶² AIR 1992 Pat 86.

⁶³ *K.C. Malhotra v. State*, AIR 1994 MP 48.

there should be proper lavatories for public convenience which should be regularly cleaned. Public health and safety cannot suffer on any count and all steps to be taken as Article 47 makes it a paramount principle of government for the improvement of public health as its primary duties.

In addition to the above right, the judiciary in tune of Directive Principle of State Policy and showing concern to the public health and safety, held in various cases that right to health is also a fundamental right while under Article 21 and such right grew as an offshoot of environmental litigation initiated by environmental activists regarding the environment issues. Undoubtedly the right to environment was crucial because a polluted environment affects public health. A pollution free environment as a fundamental right presupposes right to health as a fundamental right. Logically, the explicit recognition of the fundamental right to health should have preceded the fundamental right to good environment. However, the development of jurisprudence in this branch has been the reverse. The right to unpolluted environment was recognised as a right in the first instance and from that followed the right to public health, health and health care.

In *Vincent Panikurlangara v. Union of India & Ors.*⁶⁴ it was held that in a welfare State, it is the obligation of the State to ensure the creation and maintaining of conditions congenial to good health. The right to live in peace, to sleep in peace and the right to repose and health are part of the right to live. We recognise every man's home to be his castle, which cannot be invaded by toxic fumes, or tormenting sounds.

The Supreme Court relied on the international instruments in *CESC Ltd. v. Subhash Chandra Bose*⁶⁵ observed that

“Health is a state of complete physical, mental and social well being and not merely the absence of disease or infirmity. In the light of Articles 22 to 25 of the Universal Declaration of Human Rights, International Covenant on Economic, Social and Cultural Rights and in the light of socio-economic justice assured in our Constitution, right to health is a fundamental human right to workmen. The maintenance of health is a most imperative

⁶⁴ AIR 1987 SC 990.

⁶⁵ AIR 1992 SC 573.

constitutional goal whose realisation requires interaction by many social and economic factors⁶⁶.”

In *Consumer Education and Research Centre v. Union of India*⁶⁷ the Supreme Court for the first time explicitly held that ‘the right to health is an integral fact of a meaningful right to life.’ This case was concerning the occupational health hazards faced by workers in the asbestos industry. Reading Article 21 with the relevant directive principles guaranteed in articles 39 (e), 41 and 43, the Supreme Court held that the right to health and medical care is a fundamental right and it makes the life of the workman meaningful and purposeful with the dignity of person.

In the context of environment pollution it can be said that such pollution on the environment has a direction impact on public health. The relation between the two was very well understood by the Supreme Court in its various judicial pronouncements. One of the most important rulings of the Supreme Court where the effect of environment pollution on health was discussed and the state authorities were made responsible for that was *Municipal Council Ratlam v. Vardichand and Ors.*⁶⁸ This is a crucial and one of the important cases on environmental issues because for the first time the Supreme Court prescribed that in matters concerning public health financial inability was no ground for State authorities not to carry out their duties. The apex court held that a responsible Municipal Council constituted for the precise purpose of preserving public health and providing better finances cannot run away from its principal duty by pleading financial inability. Decency and dignity are nonnegotiable facets of human rights and are a first charge on local self-governing bodies. Similarly, providing drainage system – not pompous and attractive, but in working condition and sufficient to meet the needs of the people – cannot be evaded if the municipality is to justify its existence.

In *T. Ramakrishna Rao v. Hyderabad Development Authority*⁶⁹, the Andhra Pradesh High Court observed: Protection of the environment is not only the duty of the citizens but also the obligation of the State and it’s all other organs including the Courts. The enjoyment of life and its attainment and fulfilment guaranteed by Article

⁶⁶ *Ibid* at pg. 585.

⁶⁷ AIR 1995 SC 922.

⁶⁸ AIR 1980 SC 1622.

⁶⁹ 2002 (2) ALT 193.

21 of the Constitution embraces the protection and preservation of nature's gift without which life cannot be enjoyed fruitfully. The slow poisoning of the atmosphere caused by the environmental pollution and spoliation should be regarded as amounting to violation of Article 21 of the Constitution of India.

In *Virender Gaur v. State of Haryana*⁷⁰, the Supreme Court held that environmental, ecological, air and water pollution, etc., should be regarded as amounting to violation of right to health guaranteed by Article 21 of the Constitution. It is right to state that hygienic environment is an integral facet of the right to healthy life and it would not be possible to live with human dignity without a humane and healthy environment.

5.3 The Directive Principles of State Policy (DPSP)

Another feature of the Constitution of India is the Directive Principles of State Policy⁷¹, which embody the responsibility of the State towards its citizens. Although the Directive Principles are fundamental in the governance of the country they are not legally enforceable. Rather, they impose constitutional duties on the State to apply the principles and are the guidelines and goals for attaining political justice, liberty and equality as enunciated in the Preamble of the Indian Constitution. Some of them specifically deal with the various facets of human health and environment. In some cases these Directive Principles become complementary to the fundamental rights and are enforced by courts of law. All these articles are not directly related to environmental protection except Article 48-A of the Constitution of India which has been introduced by the Forty-Second Amendment Act to the Indian constitution in the year 1976.

The Parliament had considerable debate over the wording of the draft Article 48-A. Several amendments were moved in both the houses of the Parliament. In this connection H.M. Seervai has correctly pointed out:

“Article 48-A reflects an increasing awareness of people all over the word of the need to preserve the environment from pollution, especially in urban areas. Smoke, industrial waste, deleterious exhaust fumes from motor cars and other

⁷⁰ 1995 (2) SCC 577.

⁷¹ Part IV of the Constitution of India, Articles 36-51.

combustion engines are injurious to the health and well-being of the people and foul the atmosphere. The preservation of forests and their renewal by afforestation has long been recognised in India as of great importance both with reference to rainfall and to prevent erosion of the soil by depriving it of forests which protect it. The preservation of wild life is looked upon as necessary for the 'preservation of ecological balance'. Article 48-A of the Constitution of India has rightly emphasise on the fact that the State should try not only to protect but also to improve the environment"⁷².

Article 39⁷³ of the Constitution of India envisages the distribution and management of material resources which includes natural and man-made resources in such a manner that their concentration and monopoly over their use should not give rise to ecological imbalances and health hazards.

The expression 'material resources' in Article 39(b) means all things which are capable of producing wealth for the community. Everything of value or use in the material world is material resource and the individual being a member of the community, his resources are part of those of the community. It is wide enough to cover not only natural or physical resources, but also movable or immovable property, such as, land, buildings, workshops, vehicles, etc.⁷⁴. It includes those, which are already vested in the State but also in the hands of private individuals. Further, the expression 'distribution' in Article 39(b) does not mean that one's property is taken over and is distributed to others. It also includes nationalisation which is an effective means to prevent concentration of wealth in a few hands so as to benefit the society at large⁷⁵.

⁷² H.M. Seervai, *Constitutional Law of India: A Critical Commentary* pg. 2019 (Universal Law Publishing Co., New Delhi, Reprint 2010).

⁷³ Article 39 of the Constitution of India says: "The State shall, in particular, direct its policy towards securing -(a) that the citizens, men and women equally, have the right to an adequate means of livelihood; (b) that the ownership and control of material resources of the community are so distributed as best to subserve the common good; (c) that the operation of the economic system does not result in concentration of wealth and means of production to the common detriment; (d) that there is equal pay for equal work for both men and women; (e) that the health and strength of workers, men and women, and the tender age of children are not abused and that children are not forced by economic necessity to enter avocations unsuited to their age and strength; (e) that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that children and youth are protected against exploitation and against moral and material abandonment".

⁷⁴ Prof. Narendra Kumar, *Constitutional Law of India* pg. 485 (Allahabad Law Agency, New Delhi, 8th Edn., Reprint 2012).

⁷⁵ *Ibid* at pgs. 485-486.

As mentioned earlier that at the time of framing of Indian Constitution, it did not contain any specific provision dealing directly with environment. Only provision which was of some significance was Article 47 of the Directive Principles of State Policy. Under this article the State is duty bound to improve the public health. This Constitutional duty can be fulfilled only in an atmosphere of clean environment. Therefore, the improvement of standard of living can be possible only by way of raising the level of public health in a pollution free environment without which public health cannot be assured. In *Vincent v. Union of India*⁷⁶, the Court while dealing with the legal obligation of the State to prohibit the sale and use of banned drugs, accepted the right to health as a fundamental right in the following words:

“A healthy body is the very foundation for all human activities. That is why the adage ‘Sariramadyam Khalu Dharam Sadhnam’. In a welfare State, therefore, it is the obligation of the state to ensure the creation and the sustaining of conditions congenial to good health⁷⁷”.

Article 48-A is a basic index to the state to protect and improve the environment and Article 51-A (g) grant basic duty on the citizens of India to protect and improve the environment and have compassion for living creatures. The cumulative effect of Articles 48-A and 51-A (g)⁷⁸ is that both the ‘State’ as well as the ‘citizens’ is now under constitutional obligation to conserve, perceive, protect and improve the environment. Every generation owes a duty to all succeeding generations to develop and conserve the natural resources of the nation in the best possible way⁷⁹. This clearly shows that the Indian Parliament fell in line with old tradition values and conferred on the citizens of India to protect the natural environment including forests, lakes, rivers and compassion for living creatures. The language used in the article clearly indicated the principle of equity, co-existence, reverence of

⁷⁶ AIR 1987 SC 990.

⁷⁷ *Ibid* at pg. 994.

⁷⁸ Article 51-A(g) of the Constitution of India states that it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures.

⁷⁹ Armin Rosencranz, Shyam Divan, *et. al.*, *Environmental Law and Policy in India* pg. 25 (Oxford University Press, 1991).

nature and non-violence has been given a legal recognition⁸⁰. These Articles have to be considered in the light of Article 21 which secures right to life and personal liberty.

After focusing on the import and importance of these Articles Justice A. R. Lakshmanan, in *Intellectuals Forum, Tirupathi v. state of Andhra Pradesh*⁸¹ observed:

“These two Articles are not only fundamental in the governance of the country but also it shall be the duty of the State to apply these Principles in making laws and further, these two articles are to be kept in mind in understanding the scope and purport of fundamental rights guaranteed by the Constitution including Articles 14, 19 and 21 and also the various laws enacted by the Parliament and the State Legislature⁸²”.

The use of the terms ‘protect and improve’ implies the necessity of the various components of environment for human life and that improvement for human life and that improvement of the natural environment means improvement of the quality of life. Further, protection of the environment implicitly directs us not to cut the trees, keep the water of rivers and lakes, etc. clean and wholesome⁸³.

The Apex Court in *M. C. Mehta v. Union of India*⁸⁴ relied on Article 48A and gave directions to the Central and State Governments and other local bodies and boards, to take appropriate steps for the prevention and control of pollution of water. Expressing their concern for the preservation of the fragile ecology of the forest area and protection of the Tiger Reserve as well as the right of the tribals to keep body and soul together, the Supreme Court in *Animal and Environment Legal Defence Fund v. Union of India*⁸⁵, issued directions to the Government of Madhya Pradesh for properly implementing the licence and for monitoring the fishing activity of all the permit holders, within the Pench National Park area in the State.

⁸⁰ R. B. Singh and Suresh Misra, *Environmental Law in India: issues and Responses* pg. 102 (Concept Publishing Company, 1st Edn., 1996).

⁸¹ (2006) 3 SCC 549.

⁸² *Ibid* at pg. 552.

⁸³ R. B. Singh and Suresh Misra, *Environmental Law in India: issues and Responses* pg. 105 (Concept Publishing Company, 1st Edn., 1996).

⁸⁴ AIR 1987 SC 1086.

⁸⁵ AIR 1997 SC 1071.

5.4 Fundamental Duties

Article 51A(g) specifically deals with the fundamental duty with respect to environment. It provides that it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wild life and to have compassion for living creatures. To put it simply this Article refers to the fundamental duty of every citizen to protect and improve 'natural environment'. The provision of fundamental duty flows from the World Charter for Nature adopted by the United Nations General Assembly on 28 October 1982. The Charter recognizes the right of the individual and non-governmental entities by providing that all persons shall have access to means of redress when their environment has suffered damage or degradation⁸⁶. The Charter also imposes a corresponding duty upon persons too ensure that objectives and requirements of Charter are fulfilled⁸⁷. Indian Constitution has imposed a joint responsibility upon the State; and every citizen of India to protect and improve the natural environment. In the words of Ranganath Mishra, J.:

“Preservation of environment and keeping the ecological balance unaffected is a task which not only Government but also every citizen must undertake. It is a social obligation and let it remind every citizen that it is his fundamental duty as enshrined in Article 51-A (g) of the Constitution”⁸⁸.

The term ‘to have compassion of living creatures’ used in Article 51A(g) impliedly recognizes the principle that all creates are made equal and that animal killing should be prohibited as taught by the principle of non-violence or as the moral code of conduct says ‘killing of animals and birds is a sin of highest orders’. The scope of Article 51A(g) was examined by the High Court of Rajasthan in *L.K. Koolwal v State of Rajasthan*⁸⁹. Under the Rajasthan Municipalities Act, 1959 Clauses © and (d) of Section 98, the Municipal Authority is charged with the primary duty “to clean public streets, sewers and all spaces and places, not being private property, which are open to the enjoyment of public, removing of noxious vegetation and all public nuisances and to remove filth, rubbish, nigh soil, odour or any other noxious or offensive matter”. The petitioner L. K. Koolwal moved a writ petition

⁸⁶ Article 23, World Charter for Nature.

⁸⁷ Article 24, World Charter for Nature.

⁸⁸ *Rural Litigation and Entitlement Kendra v. State of UP*, AIR 1987 SC 359, at p. 364.

⁸⁹ AIR 1988 Raj 2.

under Article 226 of the Constitution before the Rajasthan high Court showing that the municipality has failed to discharge its “primary duty” resulting in the acute sanitation problem in the city of Jaipur which is hazardous to the life of the citizens of Jaipur. The High Court while pronouncing the judgment explained the true scope of Article 51A in the following term:

“We can call Article 51A ordinarily as the duty of the citizens. But in fact it is the right of the citizens as it creates the right in favour of citizens to move to the Court to see that the State performs its duties faithfully and the obligatory and primary duties are performed in accordance with the law of the land. Omissions or commissions are brought to the notice of the Court by the citizen and thus, Article 51A gives a right to the citizens to move the Court for the enforcement of the duty cast on State instrumentalities, agencies, departments, local bodies and statutory authorities created under the peculiar law of the State⁹⁰”.

Thus, Article 51A has come as a boon so far as environmental protection is concerned. But its benefit can be availed of only if people are alive to their duties regarding protection of environment⁹¹. In *Taj Trapezium case*⁹², the Supreme Court has interpreted Articles 48A and 51A(g) as constitutional mandate to protect and improve the environment. Commenting on the legal value of these Articles, Karnataka High Court in *Obayya Pujari v Member Secretary, KSPCB, Bangalore*⁹³, observed:

“When the court is called upon to give effect to the directive principle and the fundamental duty, the court is not to shrug its shoulders and say that priorities are a matter of policy and so it is a matter for the policy making authority. The least that the Court may do is to examine whether appropriate considerations are borne in mind and irrelevancies excluded. In appropriate cases, the court may go further, but how much further depends upon the circumstances of the case. The court may always give the necessary directions⁹⁴”.

⁹⁰ *Ibid* at pg. 4.

⁹¹ H. N. Tiwari, *Environmental Law* pg.83 (Allahabad Law Agency, Faridabad, Reprint 2012).

⁹² *M.C. Mehta v. Union of India* AIR 1997 SC 734.

⁹³ AIR 1999 Kant 157.

⁹⁴ *Ibid* at pg. 163.

In *Rural Litigation and Entitlement Kendra v State of UP*⁹⁵, the Apex Court observed:

“The consequences of interference with ecology and environment have now come to be realized. It is necessary that the Himalayas and the forest growth on the mountain range should be left uninterfered with so that there may be sufficient quantity of rain. The top soil may be preserved without being eroded and the natural setting of the area may remain intact. Of course, natural resources have got to be tapped for the purposes of social development but one cannot forget at the same time that tapping of resources has to be done with requisite attention and care so that ecology and environment may not be affected in any serious way. There may not be any depletion of water resources and long-term planning must be undertaken to keep up the national wealth. It has always to be remembered that these are permanent assets of the mankind are not intended to be exhausted in one generation. Preservation of the environment and keeping ecological balance unaffected is a task which not only the Governments but also every citizen must undertake. It is a social obligation and let every Indian citizen be reminded that it is his fundamental duty as enshrined in Article 51A (g) of the Constitution⁹⁶”.

The Supreme Court gave effect to the social obligation to protect the environment and reminded every Indian citizen of his fundamental duty as enshrined in Article 51A (g) to protect the environment. In *Sitaram Chhaparia v State of Bihar*⁹⁷, Patna High Court held that protection of the environment is a fundamental duty. The petition was filed as public interest litigation alleging that an industrial unit consisting of a tyre retreading plant set up in the residential area was emitting carbon dioxide gas and other obnoxious gases from its furnaces causing harm to the environment of the locality. The Court regretted that the State Government of Bihar and the Bihar State Pollution Control Board paid lip service to their obligations under the law to monitor and prevent environmental pollution especially under the Constitution of India and the Environment (Protection) Act 1986 which require strict vigil on matters of environment and ecology. The Court termed such impervious

⁹⁵ AIR 1985 SC 652..

⁹⁶ *Ibid* at pg. 658.

⁹⁷ AIR 2002 Pat 134.

approach and attitude by state functionaries as ‘anti-nature’. The High Court of Patna finally held that protecting the environment is a fundamental duty under Article 51A of the Constitution of India.

5.5 Legislative Relations

The legislative relations between the Union and the States are governed by Part XI of the Constitution of India. Article 246⁹⁸ of the Constitution makes division of the legislative areas between the Union and the States with reference to the three lists in the Seventh Schedule to the Constitution. The Indian Constitution provides for a federal structure within the framework of parliamentary form of government. Article 246 divides the subject areas for legislation into three lists, viz., Union List, State List and Concurrent List⁹⁹. A perusal of the various subjects enumerated in the three lists will reveal that there is no entry providing for ‘Environmental Protection’ either in List I, List II or in List III. The omission of specific legislative entry on environmental protection from the Central List and the Concurrent List has created the problem of legislative competency for Parliament whenever it wanted to enact an environmentally related legislation. Moreover, the distribution of subjects also gave rise to certain problems. Pertaining to legislative competency, most of the legislative entries, which relate to environmental protection such as public health and sanitation, agriculture, water supplies, irrigation and fisheries etc. are included in the State List. This Constitutional scheme of distribution of legislative power prevents Parliament from legislating on these subjects in ordinary circumstances, though it is often felt that central legislation is more desirable in these areas¹⁰⁰.

⁹⁸ Article 246 of the Constitution of India states: Subject-matter of laws made by Parliament and by the Legislatures of States-(1) Notwithstanding anything in clauses (2) and (3), Parliament has exclusive power to make laws with respect to any of the matter enumerated in List I in the Seventh Schedule (in this Constitution referred to as the ‘Union List’).

(2) Notwithstanding anything in Clause (3), Parliament and subject to clause (1), the Legislature of any State also, have power to make laws with respect to any of the matters enumerated in List III in the Seventh Schedule (in this Constitution referred to as the ‘Concurrent List’)

(3) Subject to clauses (1) and (2), the Legislature of any State has exclusive power to make laws for such State or any part thereof with respect to any of the matters enumerated in List II in the Seventh Schedule (in this Constitution referred to as the ‘State List’)

(4) Parliament has power to make laws with respect to any of matter for any part of the territory of India not included in a State notwithstanding that such matter is a matter enumerated in the State List.

⁹⁹Gurdip Singh, *Environmental Law in India* pg. 56 (Macmillan Publishers India Ltd., Delhi, Reprint, 2011).

¹⁰⁰Aruna Venkat, *Environmental Law and Policy* pg. 52 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

To overcome this difficulty, Parliament had to take recourse, using its power under Article 249¹⁰¹ or Articles 252¹⁰². Under Article 249, Parliament is empowered to legislate in the “national interest” on matters enumerated in the State list. Similarly, under Article 252, Parliament may enact laws on State subjects, for those States, whose legislatures have consented to central legislation. Thus, the Water (Prevention and Control of Pollution) Act of 1974 was enacted by Parliament pursuant to consent resolutions passed by 12 State legislatures. In this context, Articles 253¹⁰³ of the Constitution assumes a lot of importance from an environmentalist’s point of view. Article 253 empowers Parliament to make laws implementing India’s international obligations as well as any decision reached at an International Conference, association or other body. In view of the broad range of issues addressed by international conventions, conferences, treaties and agreements, Article 253 apparently gives Parliament the power to enact laws on virtually any entry contained in the State List. Parliament has used this power to enact the Air (Prevention and Control of Pollution) Act of 1981 and the Environment (Protection) Act of 1986. The preambles to both

¹⁰¹ Article 249 of the Constitution states: Power of Parliament to legislate with respect to a matter in the State List in the national interest.- (1) Notwithstanding anything in the foregoing provisions of this Chapter, if a Council of States has declared by resolution supported by not less than two-thirds of the members present and voting that it is necessary or expedient in national interest that Parliament should make laws with respect to any matter enumerated in the State List specified in the resolution, it shall be lawful for Parliament to make laws for the whole or any part of the territory of India with respect to that matter while the resolution remains in force. (2) A resolution passed under clause (1) shall remain in force for such period not exceeding one year as may be specified therein: Provided that, if and so often as a resolution approving the continuance in force of any such resolution is passed in the manner provided in clause (1), such resolution shall continue in force for a further period of one year from the date on which under this clause it would otherwise have ceased to be in force. (3) A law made by Parliament which Parliament would not but for the passing of a resolution under clause (1) have been competent to make shall, to the extent of the incompetency, cease to have effect on the expiration of a period of six months after the resolution has ceased to be in force, except as respects things done or omitted to be done before the expiration of the said period.

¹⁰²Power of Parliament to legislate for two or more States by consent and adoption of such legislation by any other State-(1) If it appears to the Legislature of two or more States to be desirable that any of the matters with respect to which Parliament has no power to make laws for the States except as provided in Articles 249 and 250 should be regulated in such States by Parliament by law, and if resolutions to that effect are passed by all the Houses of the Legislatures of those States, it shall be lawful for Parliament to pass an Act for regulating that matter accordingly, and any Act so passed shall apply to such States and to other State by which it is adopted afterwards by resolution passed in that behalf by the House or, where there are two Houses, by each of the Houses of the Legislature of that State. (2) Any Act so passed by Parliament may be amended or repealed by an Act of Parliament passed or adopted in like manner but shall not, as respects any State to which it applies, be amended or repealed by an Act of the Legislature of that State.

¹⁰³ Legislation for giving effect to international agreements- Notwithstanding anything in the foregoing provisions of this Chapter, Parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body.

laws states that these Acts were enacted to implement the decisions reached at the United Nations Conference on the Human Environment held at Stockholm in 1972¹⁰⁴.

Firstly, environmental protection and improvement was explicitly made a Directive Principle of State Policy incorporating Article 48-A¹⁰⁵ to the Constitution. Secondly, Article 51-A (g)¹⁰⁶, in a new chapter entitled “Fundamental Duties”. Thirdly, the Amendment introduced a new entry to the Concurrent List, “Population Control and Family Planning”¹⁰⁷, while “Forests”¹⁰⁸ and “Protection of Wild Animals and Birds”¹⁰⁹ were transferred from the State List to the Concurrent List.

There are certain subjects with respect to which Parliament has exclusive power to make laws such as major industries¹¹⁰, major ports¹¹¹, oilfields and mineral oil resources petroleum and petroleum products, dangerously inflammable liquids and substances¹¹², mines and mineral development¹¹³, inter-state rivers and river valleys¹¹⁴, fishing and fisheries beyond territorial waters¹¹⁵, ancient and historical monuments and national importance¹¹⁶, inter-state migration¹¹⁷, maritime shipping and navigation¹¹⁸, national highways¹¹⁹, explosives¹²⁰, atomic energy¹²¹, railways¹²² and airways¹²³.

¹⁰⁴ Aruna Venkat, *Environmental Law and Policy* pg. 80 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

¹⁰⁵ The Article states-“The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country”.

¹⁰⁶ It states-“It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures”.

¹⁰⁷ Entry 20-A, List III, Seventh Schedule of the Constitution of India.

¹⁰⁸ Entry 17-B, List III, Seventh Schedule of the Constitution of India.

¹⁰⁹ Entry 17-A, List III, Seventh Schedule of the Constitution of India.

¹¹⁰ Entries 7 and 52, List I, Seventh Schedule of the Constitution of India.

¹¹¹ Entry 27, List I, Seventh Schedule of the Constitution of India.

¹¹² Entry 53, List I, Seventh Schedule of the Constitution of India.

¹¹³ Entry 54, List I, Seventh Schedule of the Constitution of India.

¹¹⁴ Entry 56, List I, Seventh Schedule of the Constitution of India.

¹¹⁵ Entry 57, List I, Seventh Schedule of the Constitution of India.

¹¹⁶ Entry 67, List I, Seventh Schedule of the Constitution of India.

¹¹⁷ Entry 81, List I, Seventh Schedule of the Constitution of India.

¹¹⁸ Entry 25, List I, Seventh Schedule of the Constitution of India.

¹¹⁹ Entry 23 List I, Seventh Schedule of the Constitution of India.

¹²⁰ Entry 5 List I, Seventh Schedule of the Constitution of India.

¹²¹ Entry 6 List I, Seventh Schedule of the Constitution of India.

¹²² Entry 23 List I, Seventh Schedule of the Constitution of India.

¹²³ Entry 2 List I, Seventh Schedule of the Constitution of India.

The matters in respect of which both Parliament and legislature of any State have power to make laws include prevention of cruelty to animals¹²⁴, forests¹²⁵, protection of wild animals and birds¹²⁶, population control and family planning¹²⁷, minor ports¹²⁸, factories¹²⁹, mechanically propelled vehicles¹³⁰ and economic and social planning¹³¹. The exclusive State subjects, among other things, are public health and sanitation¹³², agriculture¹³³, preservation of stock¹³⁴, water¹³⁵, land¹³⁶, fisheries¹³⁷, gas and gas works¹³⁸, local government¹³⁹, industries, the control of which has not been taken over by the Union¹⁴⁰, and regulation of mines and mineral development subject to the provisions of the Union List with respect to regulation and development under the control of the Union¹⁴¹.

In 1980, the Tiwari Committee recommended that a new entry on “Environmental Protection” be included in the Concurrent List to enable the Central Government to legislate on environmental subjects. It may be noted, in this context, that as early as in 1979, a scholastic view in support of the inclusion of “Environmental Protection” as a separate concurrent legislative subject was already expressed. It is unfortunate that this valuable suggestion has not been acted upon as yet to enable both Parliament and State legislature to legislate on all aspects of environment without any constitutional hindrance¹⁴².

¹²⁴ Entry 17, List III, Seventh Schedule of the Constitution of India.

¹²⁵ Entry 17-A (Originally, the subject of ‘Forest’ was included in List II, entry 19. It was transferred to List III by 42nd Amendment of the Constitution, as the States did not follow a uniform policy for protection of forests.)

¹²⁶ Entry 17-B. Originally, the subject of ‘Protection of Wild Animals and Birds’ was contained in List II, Entry 20.

¹²⁷ Entry 20-A. (This is a new subject added by 42nd Amendment.)

¹²⁸ Entry 31 List I, Seventh Schedule of the Constitution of India.

¹²⁹ Entry 36 List I, Seventh Schedule of the Constitution of India.

¹³⁰ Entry 32 List I, Seventh Schedule of the Constitution of India.

¹³¹ Entry 20 List I, Seventh Schedule of the Constitution of India.

¹³² Entry 6, List II, Seventh Schedule of the Constitution of India.

¹³³ Entry 14 List II, Seventh Schedule of the Constitution of India.

¹³⁴ Entry 15 List II, Seventh Schedule of the Constitution of India.

¹³⁵ Entry 17 List II, Seventh Schedule of the Constitution of India.

¹³⁶ Entry 17 List II, Seventh Schedule of the Constitution of India.

¹³⁷ Entry 21 List II, Seventh Schedule of the Constitution of India.

¹³⁸ Entry 25 List II, Seventh Schedule of the Constitution of India.

¹³⁹ Entry 5 List II, Seventh Schedule of the Constitution of India.

¹⁴⁰ Entry 24 List II, Seventh Schedule of the Constitution of India.

¹⁴¹ Entry 23 List II, Seventh Schedule of the Constitution of India.

¹⁴² Aruna Venkat, *Environmental Law and Policy* pg. 83 (PHI Learning Pvt. Ltd., New Delhi, 1st Edn., 2011).

Mention should be made of Article 248¹⁴³ which confers Residuary Powers on the Parliament to make laws with respect to any matter not enumerated in Concurrent List or State List. The predominancy of Parliamentary Legislation over State Legislation on matters enumerated in the Concurrent List is subject to Article 254.¹⁴⁴ This Article clarified that in case of conflict between Parliamentary and State legislation the former will prevail over the later. However, State Legislation will prevail over Central Legislation on a matter contained in the Concurrent List only if the State Legislation is passed after the Parliamentary Legislation and it was reserved for the consideration of the President and has received assent from the President.

On the other hand, the Eleventh and Twelfth Schedules to the Constitution list the subjects to be devolved to the rural and urban local governments respectively, but these are carried out concurrently with the state governments. The Eleventh Schedule added by the Constitution Seventy-Third (Amendment) Act, 1992 which received the assent of President on 20.4.1993. This schedule has 8 entries (2, 3, 6, 7, 11, 12, 15 and 29). The environmental functions listed for the rural local governments include land improvement, land consolidation and soil conservation, minor irrigation, water management and watershed development, fisheries, social forestry and farm forestry, minor forest products, drinking water, fuel and fodder non-conventional energy sources and maintenance of community assets. For urban local bodies, the list includes subject like water supply for domestic, industrial, and commercial purposes; public health, sanitation, conservancy and solid waste management; and urban

¹⁴³ Article 248 of the Constitution of India States: Residuary powers of legislation- (1) Parliament has exclusive power to make any law with respect to any matter not enumerated in the Concurrent List or State List.(2) Such power shall, include the power of making any law imposing a tax not mentioned in either of those lists.

¹⁴⁴ Article 254 of the Constitution of India states: Inconsistency between laws made by Parliament and laws made by the Legislatures of States. – (1) If any provision of a law made by the Legislature of a State is repugnant to any provision of a law made by Parliament which Parliament is competent to enact, or to any provision of an existing law with respect to one of the matters enumerated in the Concurrent List, then, subject to the provisions of clause (2), the law made by Parliament, whether passed before or after the law made by the Legislature of such State, or, as the case may be, the existing law, shall prevail and the law made by the Legislature of the State shall, to the extent of the repugnancy, be void. (2) Where a law made by the Legislature of a State with respect to one of the matters enumerated in the Concurrent List contains any provision repugnant to the provisions of an earlier law made by Parliament or an existing law with respect to that matter, then, the law so made by the Legislature of such State shall, if it has been reserved for the consideration of the President has received his assent, prevail in that State.

Provided that nothing in this clause shall prevent Parliament from enacting at any time any law with respect to the same matter including a law adding to, amending, varying or repealing the law so made by the Legislature of the State.

forestry, protection of the environment and promotion of ecological aspects, provision of urban amenities and facilities such as parks, gardens and playgrounds etc.

Similarly, the Twelfth Schedule of the Constitution added by Seventy-Forth (Amendment) Act, 1992 commands the urban local bodies such as municipalities to perform the functions for the protection of environment and promotion of ecological aspects. The constitutional changes effected in the Seventh Schedule by the Forty-Second Amendment Act, 1976 is a milestone steps, in the direction of the protection of environment. Because the subject of forests originally was in the State list as entry 19, this resulted into no uniform policy by the State so as to protect the forests. By placing the item forest now in the concurrent list by the entry 17-A, along with the State, Parliament has acquired a law making power. Because of the above change, in order to have a uniform policy in the forest management the Government of India in the year 1980 set up the Ministry of Environment and Forests. By virtue of this change Parliament also enacted, the Central Legislation i.e. Forest Conservation Act, 1980, which was amended in 1988. Similarly the insertion of the entry 17-B in the concurrent list has empowered the Parliament to enact a law with a view to protection of wild animals and birds. Although we had a comprehensive legislation in the form of Wildlife Protection Act of 1972 the Forty-Second Amendment has considered the wildlife along with forests. India has also formulated National Action Plan for the protection of wild life. The new entry 20-A in the Concurrent List empowers the Parliament to regulate the population explosion one of the prime cause of the environmental pollution. By these changes, legally and constitutionally now it is possible to take a uniform action in the matters of proper management of the environment.

5.6 The Role of Judiciary for the Management of Bio-Medical Waste

It is important to note here that the abovementioned decided cases of various High Courts and the Apex Court did not specifically dealt with the issues relating to the bio-medical waste although the other types of wastes had been the issues in many cases decided by such courts in India. The environmental concern for bio-medical waste is of recent origin and had not looked into with that seriousness as it was seen in other types of waste. Regarding other wastes, especially solid waste such as rubbish, filth, or any noxious or offensive matter etc. the court has mandated

municipal authorities to ensure their proper and scientific disposal. It also imposes duty on the Pollution Control Boards to assist in the proper disposal of the waste. The matter concerning bio-medical waste for the first time drew the attention in *Dr. B.L. Wadhera v. Union of India*¹⁴⁵ case. The fact of the case is, one, B. L. Wadhera, a lawyer, approached the Apex Court seeking direction to the Municipal Corporation of Delhi (MCD) and New Delhi Municipal Council (NDMC) to perform their statutory duties and in particular the collection, removal and disposal of garbage and other wastes including the hospital waste. The court emphatically pronounced that the 'resident of Delhi have a statutory right to live in a clean city.' Therefore, MCD and NMCD are under a statutory obligation to scavenge and clean the city and 'it is mandatory for these authorities to collect and dispose of the garbage/waste generated from various sources in the city.' It was further observed that 'non-availability of funds inadequacy or inefficiency of the staff, insufficiency of machinery etc. cannot be pleaded as ground for non-performance of their statutory obligations.'

The Court also issued various directives to MCD and NDMC regarding the collection, transportation and disposal of garbage and hospital waste. Directions were also issued to install sufficient number of incinerators particularly in the hospitals with 50 beds or more. Sanitary Land Fills were to be identified for disposal of garbage and solid waste. MCD and NDMC with NEERI were also directed to find out alternate method/methods of garbage and solid waste disposal. It was also mentioned that the residents of Delhi must be educated through mass media regarding their civic duties and that in case they violate any provision of the respective Acts they must be penalised. Directions were also issued in the matter of collecting and disposal of garbage.

The Government was directed to appoint Municipal Magistrate for the trial of the erring persons. And the Central Pollution Board and Delhi Pollution Committee were also directed to send inspection teams to ascertain that collection transportation and disposal of garbage/waste is carried out satisfactorily. Thus, the Court, through this decision tried to evolve a code of conduct for the municipal authorities and general public to collect, and dispose of the garbage/solid waste.

¹⁴⁵ AIR 1996 SC 2969.

It was first case where Court dealt with the right to clean environment of the citizens and obligatory duty of the government and its instrumentalities to keep the city and town clean. The Court also ordered for construction of compost plant—at least five, within a period of six months. And to use the ‘Sanitary Land Fill’ areas for forestry purposes only.

As a sequel to it, the land mark case that drew attention to and changed the manner in which waste is handled in major cities is the ruling in the *Almitra Patel*¹⁴⁶ case. A writ petition was filed by Almitra H. Patel regarding the management of solid waste disposal in four metropolitan cities—namely, Mumbai, Chennai, Calcutta and Delhi. It also referred to Bangalore, but the Court took up the case of National Capital Territory of Delhi. The Court by an order dated January 16, 1996 appointed a Committee headed by Mr. Asim Burman to look into the aspects of ‘municipal solid waste management’. The Committee gave its report which was circulated to all the States.

The pronouncement made by the Supreme Court compelled the Central Government, the Ministry of Environment and Forest to notify the Municipal Solid Waste (Management and Handling) Rules, 2000. The Almitra Patel case brought to fore the need for door-to-door collection of waste, segregation of waste at source as dry and wet, new and appropriate technologies for the handling of waste and final disposal. While it was a good first step in addressing serious concerns relating to waste management, regrettably, the focus of this petition was not on reducing and recycling waste with the concomitant directions to ensure penalties on large polluters and reward efforts to recycle with tax breaks and subsidies. It may well be the subject of another writ petition.

In *Almitra* case, the court also expressed its unhappiness for non-compliance of its directions issued in *Dr. B. L. Wadhwa* case. Therefore, the court again issued ten directions in addition to and not in derogation to the order passed in the *Wadhwa* case, some of which are as follows—

1. The Municipal Corporation of Delhi, NDMC and all other concerned officials to ensure that the relevant provisions of the DMC Act, 1957, New

¹⁴⁶ *Almitra H. Patel v. Union of India*, (1998) 2 SCC 416.

Delhi Municipal Council Act, 1994 and the Cantonments Act, 1924 relating to sanitation and public health prohibiting accumulation of any rubbish, filth, garbage or other polluted obnoxious matters in any premises and/or prohibiting any person from depositing the same in any street or public place shall be scrupulously complied.

2. That the streets, public premises such as parks etc. shall be surface cleaned on daily basis, including on Sundays and public holidays.

3. To levy and recover charges and costs from any person littering or violating provisions of the diverse Acts, Bye-laws and Regulations relating to sanitation and health for violating the directions being issued herein.

4. To ensure proper and scientific disposal of waste in a manner so as to subserve the common good.

5. That the sites for landfills will be identified bearing in mind the requirement of Delhi for the next twenty years within a period of four weeks.

6. To take appropriate steps for preventing any fresh encroachment or unauthorised occupation of public land for the purpose of dwelling resulting in creation of a slum. Further appropriate steps be taken to improve the sanitation in the existing slums till they are removed and the land reclaimed.

7. To identify and make available to the MCD and NDMC within four weeks from today sites for setting up compost plants. Initially considering the extent of solid waste, which is required to be treated by compost plants, the number of sites which should be made available will be eight¹⁴⁷.

Above mentioned directions and direction issued in *Dr. B.L. Wadhwa* case almost forms a code for the collection, transportation and disposal of the municipal solid waste. Thus, the directions issued by the Supreme Court reiterated the local self government has to play an important role in managing the municipal solid waste disposal of the metropolitan cities of India and their in-action, and non-performance and non-compliance of statutory duties and obligation would attract prosecution and punishment.

¹⁴⁷ *Ibid* at pg. 1268

Dinanath Waghmare v. The District Collector, Nagpur District,¹⁴⁸ the present public interest litigation has been filed by the present petitioner, who claims to be a social worker, pointing out to the notice of this Court the unhygienic conditions of the various government hospitals including medical college and hospitals, rural hospitals, cottage hospitals, public health centers and sub centers. After hearing both the parties the court has directed for the constitution of a Committee to see as to what are the lacunae in the system and what are the corrective measures that can be taken for ensuring the right to health.

In *Environment Monitoring Forum v. Union of India and Ors.*,¹⁴⁹ it was held by the court that it is the duty of the institutions generating biomedical waste to take all steps to ensure that such waste is handled without any adverse effect to human health and environment.

*K. Ashok Kumar and Ors. v. State of Tamil Nadu and Ors.*¹⁵⁰, the court observed the issues relating to environmental protection, disposal of biomedical waste, certainly endangers the living condition which definitely attract Article 21 of the Constitution of India which confer fundamental right of living , which means to live with all dignity and the State Government was instructed to comply the section 49 (2) of Town and country planning Act and to follow the other relevant rules to prevent health hazards and environmental distress.

*Qualified Medical Practitioners and Hospitals Association, Kerala v. Union of India*¹⁵¹. This writ petitions is filed by the Bio-Medical Waste Management Committee regarding the insistence for incinerator for the bio-medical wastes. The treatment of bio-medical waste by incineration causes adverse effect on the environment and health of the public. The usage of incineration is clear infringement of the Art.21 of the Constitution of India. The court by passing an interim order permits the members of the petitioner organisation usage of Placenta Anaerobic Bio-Reactor. (PAB) for all anatomical material organs and body parts without bones and Body Parts Anaerobic Bio-Reactor (BPAB) for treatment of medical waste and also directed to issue authorisation for its use till the disposal of the writ petition.

¹⁴⁸ PIL No. 121 of 2013.

¹⁴⁹ MANU/KE/0894/2003.

¹⁵⁰ Available at: Indian.kanoon.org/doc/1041112 (March 17, 2008), (Last visited on Dec. 15, 2015).

¹⁵¹ AIR 2002 SC 3689.

Again in *Maitree Sansad v. State of Orissa*¹⁵², the petitioner, a voluntary organisation has come up with the present writ petition inter alia, alleging that the three Medical Colleges and Hospitals run by the Government in the State as well as various Nursing Homes situated in the city of Cuttack and elsewhere in the State by not following the provisions of law and not taking appropriate steps for due disposal of bio-medical waste are causing air and water pollution inasmuch as the same is hazardous to the health of the local people as well as the patients and their attendants who are treated in the said hospitals/nursing homes. The court held that improper practices such as dumping of bio-medical waste in municipal dustbins, open spaces, water bodies etc., leads to the spread of diseases. Emissions from incinerators and open burning also leads to exposure to harmful-gases-which can cause cancer and respiratory diseases. Exposure to radioactive waste in the waste stream can also cause serious health hazards. An often-ignored area is the increase of in-home healthcare activities. An increase in the number of diabetics who inject themselves with insulin, home nurses taking care of terminally ill patients etc., all generate bio-medical waste which can cause health hazards.

P. K. Nayyar & Ors. v. Union of India & Ors.,¹⁵³ the question answered in this case was whether facility being run in collaboration with a private company of biomedical waste management be deemed near or far away from residential localities which are located at a distance of thirty to forty meters. The residents of Sukhdev Vihar made representations against operation of the said facility, expressing serious concern with respect to adverse effect on their health due to operation of the said facility. The court held that, it is not in dispute that bio-medical waste is a hazardous waste which can be highly injurious to human life that precisely appeared to be reason for it being included in list of prohibited/negative list of industries. 30 meters or it is 40 meters could not be said to be a safe distance in sense that it was not unlikely to adversely affect health of residents of nearby complex and/or nearby habitats. In fact decision of Government of NCT of Delhi, which was a partner in concerned venture to shift it from present site was also an acknowledgement that being in close proximity of the residential colonies, facility was likely to cause damage to environment and adversely affect health of nearby residents. Further right to live in an

¹⁵² 2007 (Supp.1) OLR 246.

¹⁵³ 198 (2013) DLT689.

environment free from pollution is a facet of fundamental right of life and liberty guaranteed under Article 21 of the Constitution.

5.7 An Overview

A close look at these provisions makes it clear that our constitution enshrines ample provisions to control and regulate environmental pollution. Under these, a good number of legislations have been enacted and they are capable of producing good results but the most important thing is the strong and effective implementations of the laws to produce desired effect. The matter relating to Bio-Medical Waste (BMW), also can be properly handled under these provisions. The coordinate and uniform action by both the legislators and the judiciary would help in minimising the menace of health & hygiene problem on the subject.

CHAPTER VI

MANAGEMENT OF BIO-MEDICAL WASTE UNDER THE GENERAL AND PARTICULAR ENVIRONMENTAL LEGISLATION IN INDIA

It is clear from the previous chapters (chapter IV and chapter V) that India has been one of those few countries in the world which have paid attention in the field of environment protection right from the ancient period down to the present time. The Chapters highlighted on how ancient and medieval India paid attention on the preservation and protection of nature by adopting the method of worshipping air, water, sun, sky, earth with the purpose of infusing in the mind of the common people a kind of fear so that any attempt made in the destruction of nature would amount to sin and accordingly the sinner would be punished by the God. Although no such laws were there available on the prevention and control of environmental pollution during that period, yet there were customary laws, conventions, etc. which guided public life. For example, cutting of trees were strictly prohibited, destruction of the forest was considered as destruction of the nature, protection of animals were considered as sacred duty etc. Due to non-availability of vehicles and industries during that period, the problem of pollution from such sources did not arise. However, during the early British period in India, we find the existence of statutory laws having bearings on the environment. These laws, however, were enacted for the purpose of meeting environment pollution under the general laws but they were not meant to deal with the specific problems of pollution. In fact, the pollution related issues were better handled under such laws only and therefore, no necessity arises for the specific laws on specific environmental issues like the problem concerning the bio-medical waste etc. This was, perhaps, due to the reason that such problem either had created no such situations which was considered dangerous from environmental point of view or the people were unaware about its ill effect on the environment. Hence, need for the enactment of necessary laws on the subject did not arise.

In the course of time, with the rapid advancement of science and technology and cropping up of new problems, provisions under such laws became inadequate to deal with the growing menace of environmental pollution on specific subject. Naturally, the necessity was felt to have some regulatory measures for the abatement

of the pollution to cope up with the new environmental issues. Such regulatory measures under the effective laws were needed to reduce the problem of environment pollution which could not always be possible to handle under such general laws. Such specific laws would help in tackling the future specific problems which includes among other, the problem relating to handling and management of bio-medical waste. Although the concern for the bio-medical waste is new and the specific laws passed in this connection is only of recent origin, however, it is necessary to make an elaborate analysis of those existing general laws passed during the British regime in order to find out whether such waste could be handled under those general laws with an obvious result had the same be managed under such laws, not question would have arose to pass new laws of different subjects directly relating to the environment. Therefore, an attempt has been made under this Chapter to make an analysis not only of those general laws enacted during pre-independence period to trace out the answer to the question relating to handling and management of such specific problem i.e. bio-medical waste, also this Chapter discusses elaborately some of the specific laws, rules, regulations etc. passed by the Parliament from time to time to deal with the specific objects involve in such waste that has an adverse effect on the environment. Of course, it is out of mention to say that the law on the subject i.e. the Bio-Medical Waste Management Rules, 2016 is the main law to deal with the problem of such waste, the researcher has made an extensive research of the Bio-medical Waste Management Rules, 2016 under a separate Chapter to find out the quest whether the existing Rules is sufficient or it has to amend further so as to include provisions on the basis of which the problem can be effectively handle. The present Chapter has been divided into two parts namely; the control and management of bio-medical waste during pre-independence period under the general laws and the post-independence general and specific laws relating to the handling and management bio-medical waste. Henceforth, an attempt has been made to discuss only those environmental legislations, both general and particular, that can be directly or indirectly referred to for the management of bio-medical waste although the Bio-Medical Waste Management Rules, 2016 have been discussed in the subsequent Chapter.

6.1 Control and Management of Bio-Medical Waste during Pre-Independence Period under the General Laws

The history of environmental legislation in India dates back to pre-independence era when the country's first legislation, The Shore Nuisance (Bombay and Kolaba) Act, 1853 was passed. This Act authorised the collector of land revenue in Bombay to order the removal of any nuisance below the high-water mark in Bombay harbour¹. Subsequently a plethora of Acts was passed from time to time due to the roaring demands from various corners to pass laws in the various fields covering the water, air, land and also the forest. These laws, however, had a narrow purpose and limited territorial reach². For example, The Oriental Gas Company Act, 1857 and the Bengal Smoke Nuisance Act, 1905 were enacted to prevent or reduce pollution in the atmosphere in and around Calcutta. The Oriental Gas Company Act, 1857, under sections 15-17 imposes fines on the company and giving a right of compensation to anyone whose water was fouled by the company's discharges³. The Indian Easement Act of 1882 guaranteed property rights of riparian owners against unreasonable pollution by upstream users.⁴ The Bombay Smoke Nuisance Act, 1912 was passed to check smoke nuisance in Bombay area. Legislative provisions regulating the discharge of oil into port waters and prohibiting the poisoning of water in forests under Indian Ports Act, 1908 and Indian Forest Act, 1927 respectively were also enacted prior to independence⁵. Majority of these laws continued to exist during the period when India became free.

From the various Acts referred above it is clear that none of the Acts, rules, regulations etc. in existence at that time had any direct connection with the problem of bio-medical waste. Although, some of these Acts could be referred to and necessary steps could be taken under these laws to handle the same. As for instance, if there was any air pollution due to bio-medical waste creating nuisance in the locality or due to

¹ Shyam Divan and Armin Rosencranz, *Environmental Law and Policy in India* pg. 30 (Oxford University Press, 2nd Edn., 2013).

² *Ibid.*

³ *Ibid.*

⁴ D.P.Tripathy, *Environmental Legislation in India-A Critical Appraisal* pgs. 239-240 (APH Publishing Corporation, 1st Edn., 2002).

⁵ Shyam Divan and Armin Rosencranz, *Environmental Law and Policy in India* pg. 30 (Oxford University Press, 2nd Edn., 2013).

impractical storage or dumping of such waste water became percolated, an action could be taken under the existing law to meet the situation. The reason for not having any specific laws on the subject would be that either such waste did not create any serious harmful effect to the wholesome environment or there were lack of awareness among the people regarding the harmful effect from such waste. Another reason could be that the British rulers were keen to exploit the nature that they took least interest in protecting it.

6.1.1 The Indian Penal Code, 1860⁶(IPC)

The Indian Penal Code, 1860 (hereinafter referred to as the Code) is considered as one of the most important Code among others, passed during pre-independence period. The Code was enacted with a view to provide a general penal law for India. The Code provided for punishments of those acts which not only endangered life or causes injury to human being in particular, it also covers the cases of environmental pollution in general under the head of public nuisance. Such provisions have included in the Chapter XIV under the head of Public Nuisance and are divided into twenty eight Sections (Sections 268⁷ to 294A). The sole object of including Chapter XIV in the Code was to safeguard the public health (sections 269-278), safety (sections 279- 291) and public morals and decency (sections 292-294A) by causing those acts punishable which make environment polluted and thereby threaten the life of people. In other words, all those acts which endanger public health, whether directly or indirectly, have been brought under the purview of the Code⁸. The important sections relating to environment may be summed up as under.

6.1.1.1 Public Nuisance (Section 268)

Nuisance means anything that resulted in hurt, inconvenience, or damage, or interferes with the enjoyment of life or property and includes any act, omission, place,

⁶ Act No. 45 of 1860. It stands as a tribute to the genius of Lord Macaulay who was the President of the First Indian Law Commission constituted in 1834.

⁷ Section 268 of the Indian Penal Code read as follows: Public nuisance- A person is guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right. A common nuisance is not excused on the ground that it causes some convenience or advantage.

⁸ Mahesh Mathur, *Legal Control of Environmental Pollution: Jurisprudence and Law Applicable to Environmental Violation and Prevention* pg. 206 (Deep & Deep Publication, 1st Edn., 1998).

or thing which causes or is likely to cause injury, danger or offence to the sense of sight, smell or hearing. According to Clerk and Lindsell, nuisance is an act or omission which results in an interference with or disturbance of or annoyance to a person in the exercise or enjoyment of:

1. A right belonging to him as member of the public when it is a public nuisance or
2. his ownership or occupation of land or of some easement, quasi-easement or other right used or enjoyed in connection with land when it is a private nuisance⁹.

Public nuisance is an offence against the public in any public place or thing which is based on such act or omission. According to Russell, public nuisances are offences against the public by either doing a thing which tends to the annoyance of all the king's subjects or by neglecting to do a thing which the common good requires¹⁰.

The maxim "*sic utere tuo ut rem publicum non laedas*", which is a part of civil law meaning thereby 'enjoy your property in such a way as not to injure the right of the public' can be referred to understand the concept of public nuisance. The term public nuisance has defined under Section 268 of the Code is that if a person does any act or omits to do any act which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy property in the vicinity or which must cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right, then such act or omission comes within the purview of the same. The definition is capable of bringing within its ambit various types of public nuisance including environment nuisance. The Section is to be read with Section 290 of the Code which prescribed punishment with fine which may extend to two hundred rupees for public nuisance in those cases not otherwise specifically provided for in the Code. Furthermore, for the repetition or continuation of the same Section 291 of the Code provides additional punishment where a public servant has issued injunction for not repeating it.

- **Ingredients of Public Nuisance**

To constitute public nuisance the following essentials are required:

⁹ *Ibid.*

¹⁰ *Ibid.*

1. Doing of any act or illegal omission to do an act,
2. The act or omission:
 - a. must cause any common injury, danger, or annoyance to the public or to the people in general who dwell or occupy property in the vicinity, or
 - b. must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right.

A person must do an act or must be guilty of an illegal omission. Putting obstructions upon, causing danger, annoyance to persons upon a public road used by the public are acts causing public nuisance. The term person is defined in Section 11 of the Code to include company or association or body of the persons, whether incorporated or not and the word illegal according to Section 43 means as ‘applicable to everything which is an offence or which is prohibited by law, or which furnishes ground for a civil action’. Causing a nuisance by omission is not punishable, unless prohibited by law¹¹.

There must be an injury, danger or annoyance. It must be caused to the public or the people in general, who live or occupy property in the vicinity. It can also be caused to anyone who may have the occasion to use a public right. A public nuisance may be created by erecting a building over part of a public highway as held in *Janki Prasad v. Karamat Hussain* case.¹² But if there is no annoyance to the public, it will not be a public nuisance. For instance, in *Perumal Naidu’s* case a person urinating in a public place where there was no public urinal was held to have committed no offence under this section¹³.

There is no *sine quo non* that a public nuisance should injuriously affect every member of the public. It is sufficient that it should affect people in general who live nearby. The term ‘public’ according to Section 12 of the Code includes any class of the public, or any community. But the class must be numerically sufficient to be designated ‘the public’. Thus, a class or community residing in a particular locality may come within the term ‘public’. In popular parlance, the word ‘public’ means the general body of humankind or of a nation, State or community. Thus, the words

¹¹ Krishna Deo Gaur, *Textbook on the Indian Penal Code* pg. 387 (Universal Law Publishing Co. Pvt. Ltd., 4th Edn., Reprint 2011).

¹² 1931 ILR 53 All 836.

¹³ 1936 MWN 1151.

‘public’, ‘in general’ and ‘vicinity’ clearly indicates that there can be no public nuisance unless the general public of the locality is affected by nuisance as held in *Dwarika Prasad’s* case¹⁴.

In order to constitute the offence of public nuisance there must be a real damage as a sensible person is subjected to it would find injurious regard being had to the situation and mode of occupation of the property. The fact that a public nuisance has been in existence for a number of years in the same place will not legalise it. The second paragraph of section 268 of the Code makes it clear that a common nuisance is not excused on the ground that it causes some convenience or advantage. The nuisance must be to the general public or a section of the public and not merely to an individual or to any particular person¹⁵.

In other words, a public nuisance is an offence against the public either by doing a thing which tends to the annoyance of the whole community in general or by neglecting to do anything which the common good requires. Acts which seriously interfere with the health, safety, comfort or convenience of the public generally, or which tend to degrade public moral have always been considered to be public nuisance¹⁶.

In *K. Ramakishnan v. State of Kerala*¹⁷ the Kerala High Court held that smoking, in any form, in public place is a public nuisance and cases can be filed under section 290 of the Code as it is violative of the right to life as provided under Article 21 of the Constitution of India.

6.1.1.2 Spreading Diseases (Section 269)

It is the very essence for the existence of life that it should not be put in danger by an act which is regarded as unlawful, negligent or otherwise which make it criminal in the eye of law. Such act, if negligent involve in spreading of infection of

¹⁴ *Dwarika Prasad v. Dr. B.K. Roy Chowdhury*, AIR 1950 Cal. 349.

¹⁵ Mahesh Mathur, *Legal Control of Environmental Pollution: Jurisprudence and Law Applicable to Environmental Violation and Prevention* pg. 209 (Deep & Deep Publication, 1st Edn., 1998).

¹⁶ Krishna Deo Gaur, *Textbook on the Indian Penal Code* pg.387 (Universal Law Publishing Co. Pvt. Ltd., 4th Edn., Reprint 2011).

¹⁷ AIR 1999 Ker 385.

various diseases which endanger the life can be brought under Section 269¹⁸ of the Code which deals with the negligent act likely to spread infection of diseases dangerous to life. This section is framed in order to prevent people from doing acts which are likely to spread ‘infectious’¹⁹ diseases. There are number of ‘diseases’ which medical science considered as infectious in nature and is harmful to the public health. The section is a specific provision dealing with certain acts of nuisance which are calculated to spread the infection of dangerous diseases such as cholera, smallpox, plague, AIDS, etc²⁰.

Such diseases which is dangerous to the life of individual due to its infectious nature as when the people comes into direct connection with it or it may communicate through others who are in direct contact with it, are constantly posing a threat to the lives of the people. The bio-medical waste being one of the reasons for spreading such diseases created a cause of concerns ever since the rapid growth of population, urbanisation, industrialisation etc. and the setting up of health care institutions in the surroundings. Such waste also contains the germs of many dangerous diseases as mentioned above and if the same is not properly handled and managed, it may partake the character of national disaster polluting the environment at large. Therefore, the section can be resorted to and made punishable any act of negligence whoever is responsible in handling and managing the bio-medical waste. But in order to bring within the fore of this section the following ingredients are required to be fulfilled:

- **Ingredients of Section 269**

1. It must be shown that the disease in question was infectious and dangerous to life.
2. The accused did an act which was likely to facilitate spreading of the disease.
3. The accused did the act negligently or unlawfully and

¹⁸Section 269 of the Indian Penal Code runs as follows: “Whoever unlawfully or negligently does any act which is, and which he knows or has reason to believe to be, likely to spread the infection of any disease dangerous to life, shall be punished with imprisonment of either description for a term which may extend to six months, or with fine or with both”.

¹⁹ The term ‘infectious’ means those which are communicated through the atmosphere.

²⁰ Krishna Deo Gaur, *Textbook on the Indian Penal Code* pg. 388 (Universal Law Publishing Co. Pvt. Ltd., 4th Edn., Reprint 2011).

4. He knew or had reason to believe that his act was likely to spread the disease.

The above mentioned Section and Section 270²¹ of the Code intended to avert the great danger to society from spreading of infection. The offence under this section is an aggravated form of the offence made punishable under the preceding Section. In this Section the action of the accused in spreading infection of the disease is a malignant or malicious one which involves a deliberate intention to do harm. Hence the punishment under this Section is more serious than the previous Section 269 of the Code which may extend to six months of imprisonment, fine or both.

The element of malignancy is essential in the commission of an offence under this Section. Malignant transmission is a deliberate intention to harm. The word 'malignantly' denotes that the spreading of infection should be actuated by malice²².

Likewise, the expression 'dangerous to life' used in both the Sections is not restricted to diseases that are immediately dangerous to life. It also takes into account those diseases which act as a slow poison to the life of human beings. Therefore, all types of diseases whether of immediate effect or not could be brought under this Section and made punishable accordingly.

6.1.1.3 Fouling of Water (Sections 277 and 278)

The water of a river, spring or reservoir belongs to the public, and therefore, if a person pollutes it, he commits an offence of public nuisance. There are two specific Sections (Section 277²³ and Section 278²⁴) dealing with the fouling of water and making the atmosphere noxious to health which could be used against perpetrators of

²¹The section runs as follows: Whoever maliciously does any act which is and which he knows or has reason to believe to be, likely to spread the infection of any disease dangerous to life, shall be punished with imprisonment of either description for a term which may extend to two years or with fine, or with both.

²²Ratanlal and Dhirajlal, *Indian Penal Code* pg. 322 (Wadhwa and Company Law Publishers, 28th Edn., 1997).

²³Section 277 of the Indian Penal Code reads as follow: Fouling water of public spring or reservoir-Whoever voluntarily corrupts or fouls the water of any public spring or reservoir, so as to render it less fit for the purpose for which it ordinarily used, shall be punished with imprisonment of either description for a term which may extend to three months, or with fine which may extend to five hundred rupees or with both.

²⁴Section 278 of the Indian Penal Code reads as follows: Making Atmosphere noxious to health-Whoever voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way, shall be punished with fine which may extend to five hundred rupees.

water and air pollution. The words 'corrupts or foul' mean some act which physically defiles or fouls the water. Thus the act of a woman of a so-called lower caste taking water from a public cistern does not amount to corrupting or fouling. But bathing in a tank fouls the drinking water²⁵.

The above two provisions have direct relevancy to water and air pollution and can be seek to prevent such pollution. However, their effective application towards achieving this objective is doubtful, because in order to bring the violator under this Sections strict compliance of the ingredients is absolutely obvious. The technicalities of Indian criminal law require a complete satisfaction of the ingredients of the offence as stipulated in the penal provisions. For instance, the provisions relating to fouling of water, the wording requires proof of the voluntary corruption or fouling of water, that the water must be of a public spring or a reservoir and that the water must have been rendered less fit for the purpose for which it was ordinarily used. Such wordings not only create a burden for the prosecution to prove, but also provide the accused enough grounds to argue his way out. The above provisions did not liberate the criminal justice process from the difficulties of the common law demanding elaborate evidence for sundry matters as well as technical interpretation of obvious things and events²⁶.

Therefore, for invoking the provisions of section 277 of the Code, the party has to satisfy the court on the following points:

- **Ingredients of Section 277**

1. That the water in question was of a public spring or reservoir.
2. That the accused corrupted or fouled such water voluntarily and
3. That his action rendered the water less fit for the purpose for which it was ordinarily used.

It is to be noted that the offence under this Section only related to voluntarily fouling of a water of a public spring or reservoir. Therefore, this Section does not

²⁵Mahesh Mathur, *Legal Control of Environmental Pollution: Jurisprudence and Law Applicable to Environmental Violation and Prevention* pg. 216 (Deep & Deep Publication, 1st Edn., 1998).

²⁶C. M. Abraham, *Environmental Jurisprudence in India* pg. 43 (Kluwer Law International, 1st Edn., 1999).

apply to a ‘public river’ or to a continuous stream²⁷. The above position is well illustrated by some of the early recorded cases. In one of the earliest case recorded in 1882, *Queen v. Vitti Chokkan*²⁸, it was held in a one sentence judgment that the words ‘public spring’ or ‘reservoir’ under section 277 did not include a river. Thus the Madras High Court, in 1881, quashed the conviction of one Vitti Chokkan for having ‘dirtied the drinking waters of the Varaga River, the only drinking water available in the locality, by washing bullocks therein and also four other persons for having rendered the spring water of the Varaga River unfit for the purpose of bathing and drinking by putting up a dam across the river and catching fish’.

In *Emperor v. Nama Rama*²⁹ the accused and nine other had been convicted by the Trial Court under section 277 for the offence of fouling the waters of a river by rendering it unfit for drinking purpose. However the High Court had a different view on appeal. The Court relied upon earlier cases under the Code and held:

“Though the fouling of the waters of a river running in a continuous stream may not be an offence under section 277 of the Code, it may well be a nuisance under section 290 of the Code if the evidence shows that the act was such as to cause common injury or danger to the public.”³⁰

While this was the position to handle the environmental pollution under Section 277, let us see the position under Section 278 of the Indian Penal Code. For the applicability of this Section 278 the aggrieved party has to prove the following;

Ingredients of Section 278

1. That the accused vitiated the atmosphere,
2. That he did so voluntarily, and
3. That he thus made the atmosphere noxious to the health of persons residing and carrying on business in the neighbourhood or of those passing through the highway.

²⁷ *Ibid.*

²⁸ (1882) ILR 4 Mad. 229.

²⁹ (1904) 6 Bom. LR 52.

³⁰ *Ibid* at pg. 53.

The term 'vitate' means to disturb, spoil or pollute. Vitiating the atmosphere means polluting or disturbing the atmosphere by the addition of noise or any type of pollutant (obnoxious gases, solid or liquid)³¹. A person is said to cause an effect 'voluntarily' when he causes it by means whereby he intended to cause it or by means which at the time of employing those means he knew or had reason and belief to be likely to cause it³². 'Any place' means not only the public place but also private place, i.e. private property-place of business, residential house, go-down, shop or office, etc³³. 'Noxious' according to Chamber's English Dictionary³⁴ means hurtful or relating to wrongful injury by an object. For the fulfillment of this clause only vitiating or disturbing the atmosphere is not sufficient but the atmosphere should be polluted in such a manner as to affect the health of persons in the neighbourhood of the place of pollution or nuisance. The words 'corrupts or fouls' water is used in their literal sense. Therefore, spitting in a public well, fishing with basket nets in a tank, cultivating paddy in the bed of a tank, etc. are instances of fouling water. The mere fact that the neighbours were using the water of a well does not establish that the well is a public well as they may be using the well under leave or licence³⁵.

Similarly, contamination of the atmosphere rendering it injurious to public health also attracts the provision of this Section. In *Bijayananda Patra v. District Magistrate, Cuttack*³⁶ the Orissa High Court held that where person causing noise pollution which is noxious to health of the people, the Section can be invoked for restraining the polluter and an injunctions can be brought against him even though that person was causing noise in the course of his business. The Court further held that pollution being wrongful contamination of the environment which causes material injury to the right of an individual, noise can well be regarded as a pollutant because it contaminates environment, causes nuisance and effect the health of a person. In *St. Helen's Smelting Co. v. Tipping*³⁷ the question was whether there is danger from any trade or occupation so as to constitute a public nuisance depends

³¹Dr. Surendra Kumar, *Environment Protection* pg. 51 (Northern Central Publishers, 1st Edn., 2009).

³²*Ibid.*

³³*Ibid.*

³⁴Catherine Schwarz, George Davidson, *et. al.*, *Chambers English Dictionary* pg. 983 (Allied Publishers Limited, Reprint 1992).

³⁵Mahesh Mathur, *Legal Control of Environmental Pollution: Jurisprudence and Law Applicable to Environmental Violation and Prevention* pg. 206 (Deep & Deep Publication, 1st Edn., 1998).

³⁶AIR 2000 Ori 70.

³⁷(1865) 11 HLC 642.

upon whether the injury is to the property of person; in the former case there must be evidence of visible diminution in the value of the property for which the locality and all other circumstance must be taken into consideration. The fact of the case was that in June 1860, William Tipping purchased the Bold Hall manor house, along with 1300 acres of surrounding land. Three months later, operations began at the nearby St. Helen's Copper Smelting Company (Limited). The works emitted noxious gases and vapours which damaged Mr. Tipping's hedges and trees, sickened his cattle, adversely affected people, reduced the land's value, and generally interfered with his beneficial use of land. Mr. Tipping sued St. Helen's directors and shareholders to recover damages for injuries done to his trees and shrubs. It was held that nuisances resulting in material injury or financial harm cannot be excused, regardless of the character of the neighbourhood in which they occur.

Similarly, in *Kirori Mal Bishamber Dayal v. State of Punjab*³⁸ it was held that the question whether a particular trade is or is not a nuisance, can be determined only after taking into consideration a number of circumstances such as the place where it is located or carried on, the number of people whose rights are prejudicially affected thereby and the extend of injury, discomfort and annoyance caused to normal human beings.

Therefore, to bring a case within the purview of public nuisance, it is to be determined not merely by an abstract consideration of the thing itself, but in reference to its circumstances. The annoyance complained of must not only be real but reasonable. In an old English case³⁹, a number of persons objected to the erection of a hospital for treatment of cases of smallpox. It had to prove that not only the smallpox was popularly dreaded but that it was scientifically dreadful as that it was disseminated by aerial infection. The smallpox can be so conveyed has not received the unequivocal sanction of medical science, so that a hospital for the treatment of that disease is not necessarily a serious source of danger to persons resident, working or passing within fifty feet of it.

In view of the above case it can be said that construction of hospitals producing wastes on daily basis in a residential area causes public nuisance because the generation of hazardous wastes which is the cause of concern if unscientifically

³⁸ AIR 1958 Pun 11.

³⁹ *Attorney General v. Corporation of Nottingham*, (1904) 7 Ch 673.

handled and has an adverse effect to the public health can be brought under the several provisions of the Indian Penal Code dealing with the public nuisance.

6.1.1.4 Negligent Conduct with Respect to Certain Substances (Sections 284 to 289)

The Indian Penal Code under Sections 284 to 289 refers to negligent conduct with respect to various types of substances. The substances dealt with under these Sections vary from each other. But the nature of the conduct dealt with, is common to all the Sections. The conduct is described in the relevant sections as under:

1. Doing (with the particular substance) any act so rashly or negligently, as to endanger human life or to be likely to cause hurt or injury to any other person or
2. Knowingly or negligently omitting to take such order with the substance, in his possession, as is sufficient to guard against any probable danger to human life from such substance.
3. The substance or activities covered by the relevant provisions are the following:
 - (i) any poisonous substance (section 284),
 - (ii) fire or any combustible substance (section 285),
 - (iii) any explosive substance (section 286),
 - (iv) any machinery (section 287),
 - (v) pulling down or repairing any building (section 288) and
 - (vi) any animal (section 289).

Sections 284 and 285 provide punishments for negligent conduct with respect to poisonous substance and negligent conduct with respect to fire or combustible matter respectively which may extend to six months, or with a fine, which may extend to one thousand rupees or with both. Similarly, Section 286 of the Code provides punishment for negligent conduct with respect to explosive substance.

6.1.1.5 Mischief (Sections 425 and 426)

The water polluter can also be punished under section 425 of the Code for mischief. According to this section whoever, with intent to cause, or knowing that he

is likely to cause, wrongful loss or damage to the public or to any person causes the destruction of any property or any such change in any property or in the situation thereof as destroys or diminishes its value or utility, or affects it injuriously, commits mischief. Section 426 of the Code provides punishment for mischief. It states whoever commits mischief shall be punished with imprisonment of either description for a term which may extend to three months, or with fine, or both.

An analysis of the above Sections along with the judicial decisions makes it clear that during the pre-independence period as well as at present resort may have of these Sections for the purpose of tackling new menaces threatening the environment constantly such as bio-medical waste. Although *Attorney General* case have highlighted on a particular aspects that has relevancy with the health care institutions, it is nevertheless an important milestone which set forth that running of such institutions in a residential area, carrying dangerous objects with it had and will always have an ill effect to the community *vis-a-vis* the environment. Therefore, before allowing the authority to set up such institution it has to take into consideration all possible effort to stop the risk factor that might affect the lives of the people.

6.2 Post-Independence Specific Laws Relating to the Handling and Management of Bio-Medical Waste

The concern for the environment continues with more vigour after the independence also, when the government started taking initiatives on matters connected with public health, water, air and land and so on because the degradation of the same as it was felt, would amount to the gross environmental degradation. This was due to the impact of modern industrial development which was undertaken immediately after India got freedom and took a tremendous shape during 1970s. Such change in the country has also led to the change of perceptions at the national and regional levels and the necessity was felt to have effective laws to cope up with the situation and the outcome is the passing of specific laws and the establishment of governmental bodies designed especially to protect the environment that would help in the prevention of environment pollution. With the passage of time need was felt to have more laws on different environmental concern including the conservation aspects and the focus during 1980s was to put emphasis on such subjects. The need to

use the resources sustainable to treat ecosystems as integral units and promote the need to preserve forests and biodiversity⁴⁰ was also felt. The passing of the Water (Prevention and Control of Pollution) Act in 1974 and the Air (Prevention and Control of Pollution) Act, 1981 has been in tune of the serious concern shown in the field of protection of water, air, land etc. In the due course of time need was felt for an umbrella legislation to cover all aspects of pollution of the environment and the outcome was the enactment of the Environment (Protection) Act, 1986. The need for the adoption of policy resolutions in consonance with the needs of society to face new challenges in the field of science, technology etc. with new factors involved in it had prompted the government to pass various Acts to face such challenges. At present there are about two hundred laws dealing with environmental protection enacted both before and after independence in India⁴¹. This includes general laws⁴², which deals among other thing, the environment matters, and there are specific laws⁴³ confining only with environment. These enacted laws are supplemented by judgments of the courts through interpretation and construction, which have binding force being precedents as per Constitutional provisions⁴⁴. Since law so formulated cannot contain technical and other practical and procedural details; the Government has been conferred with the power to make rules, regulations and to issue orders. In pursuance thereof a large number of such rules, regulations and orders have been framed, issued and are in force. The passing of Bio-Medical Waste (Handling & Management) Rules 1998, Municipal Solid Waste Rules 1999, Hazardous Waste Rules, 2008 etc. are such laws among others which deserve special mention that are connected with the subject matter of this research topic. Following are the brief overview of the general and specific laws that could be resorted to in tackling the problem of bio-medical waste.

⁴⁰ Bala Krishnamoorthy, *Environmental Management: Text and Cases* pg. 32 (Prentice Hall of India Private Ltd., 2nd Edn., 2008).

⁴¹ K.R.Gupta, *Encyclopedia of Environment: Environmental Legislation in India* pg.1 (Atlantic Publishers and Distributors, 1st Edn., 2006).

⁴² The Indian Penal Code, 1860, the Code of Criminal Procedure, 1973, the Code of Civil Procedure, 1908, the Specific Relief Act, 1963 etc.

⁴³ The Water Act, 1974, the Air Act, 1981, the Environment Protection Act, 1986 etc.

⁴⁴ Mohammad Naseem, *Environmental Law in India* pg. 61 (Kluwer International Law, 2011).

6.2.1 The Factories Act, 1948

With the aim to ensure the welfare of the workers in connection with working conditions and other benefits, the Factories Act, 1948 is a post-independence statute that explicitly showed concern for the environment. While ensuring the safety and health of the workers, the Act contributes to environmental protection. The Act contains a comprehensive list of 29 categories of industries dealing with hazardous substance and envisages the process to handle the same by following the rules otherwise it might cause material impairment to health of the persons engaged in it.

According to section 2(m) of the Factories Act, factory means any premises including the precincts thereof wherein ten or more workers are or twenty or more workers are working, or were working on any day of the preceding 12 months and in any part of which is manufacturing process is being carried on with or without the aid of power respectively. Under the Act a factory is that where ‘manufacturing process’ should be carried on within the premises. The Factory Act under Section 2(k) defines the term ‘manufacturing process’ as to mean any process for making, altering, repairing, ornamenting, finishing, packing, oiling, washing, cleaning, breaking up, demolishing, or otherwise treating or adapting any article or substance with a view to its use sale, transport, delivery or disposal.

The Factories Act of 1948 also provides for the effective disposal of water and effluents of a factory under section 12⁴⁵ by an amendment of 1976 to this Act. Non-observance or non-compliance has been considered as an offence under Sec. 92 of the Act. The occupier and manager of the factory shall be liable for the offences so committed and punishable with the imprisonment for a term, which may extend to two years or with fine, which may extend to one lakh rupees or with both. In case of continuing offence after the conviction further fine may be imposed.

⁴⁵ Section 12 of the Factories Act, 1948 states that: Disposal of waste and effluents- (1) Effective arrangements shall be made in every factory for the treatment of wastes and effluents due to the manufacturing process carried on therein, so as to render them innocuous, and for their disposal. (2) The State Government may make rules prescribing the arrangements to be made under sub-section (1) or requiring that the arrangements made in accordance with sub-section (1) shall be approved by such authority as may be prescribed.

Therefore, considering the health care institutions as a factory where manufacture processes are being carried on which include among others, altering, packaging, cleaning, demolishing or treating any article or substance with a view to transport and dispose of the same, an action may be taken under this Act. The process of packaging, demolishing, treating etc. has connection with the treatment methodology provided for the handling and management of bio-medical waste also. It also provides for the effective disposal of the waste the violation of which would be subject to penalty under Section 92 of the Act. Therefore, same could be brought under the purview of the Act considering its ill effect on the environment if proper handling is not made.

6.2.2 Code of Criminal Procedure, 1973 (Cr. P. C.)

Corresponding to the Indian Penal Code, the Code of Criminal Procedure, 1973 consisted of a Chapter (Chapter X) which has divided into four parts that provides effective, speedy and preventive remedies for public nuisance cases concerning air, water and noise pollution. Part A of the Chapter deals with unlawful assemblies (Sections 129-132). Part B consisted of Sections 133-143 relating to public nuisance in general. Part C envisages provisions relating to urgent cases of nuisance or apprehended danger under Section 144 and Part D consisted of provisions concerning the disputes as to immovable property under Sections 145-148. Among all the Sections, the most relevant is Section 133, which can be resorted to as an effective, independent, speedy and summary remedy to abate public nuisance in instances of environmental harm as to compare with the cases of public nuisance under the Indian Penal Code which requires the fulfillment of strict essential ingredients following lengthy procedure to avail the benefit of it.

Under Section 133⁴⁶ of the Cr.P.C., the District Magistrate or Sub-Divisional Magistrate or an Executive Magistrate, if he is so empowered by the State

⁴⁶ Section 133 of the Code of Criminal Procedure reads as follows-Conditional order for the removal of nuisance- (1) Whenever a District Magistrate or a Sub-divisional Magistrate or any other Executive Magistrate specially empowered in this behalf by the State Government, on receiving the report of a police officer or other information and on taking such evidence (if any) as he thinks fit, considers –

- (a) that any unlawful obstruction or nuisance should be removed from any public place or from any way, river or channel which is or may be lawfully used by the public; or
- (b) that the conduct of any trade or occupation or the keeping of any goods or merchandise; is injurious to the health or physical comfort of the community, and that in consequence such

Government, on receipt of report from the police officer or other information, may make conditional order within a fixed time or immediately to remove the public nuisance causing pollution. The phrase 'public nuisance' has been defined in Section 268 of the Indian Penal Code and this definition can very well be imported for the purposes of Section 133. Therefore, this provision can be effectively invoked to prevent and control the discharge of toxic substances, gaseous emissions, dust, vapour, etc. The conditional order may be made absolute and if the person fails to carry it out, he can be prosecuted under Section 188⁴⁷ of the Indian Penal Code. But for invoking this Section the Magistrate must be satisfied that-

1. It is a public nuisance i.e. the number of persons injuriously affected is so considerable that they may reasonably be regarded as the public or a portion of it.

trade or occupation should be prohibited or regulated or such goods or merchandise should be removed or the keeping thereof regulated; or

- (c) that the construction of any building, or the disposal of any substance, as is likely to occasion conflagration or explosion should be prevented or stopped; or
- (d) that any building, tent or structure, or any tree is likely to fall and thereby cause injury to persons living or carrying on business in the neighbourhood or passing by, and that in consequence the removal, repair or support to such building, tent or structure or the removal or support of such tree, is necessary; or
- (e) that any tank, well or excavation adjacent to any such way or public place should be fenced in such manner as to prevent danger arising to the public; or
- (f) that any dangerous animal should be destroyed, confined or otherwise disposed of, such Magistrate may make a conditional order requiring the person causing such obstruction or nuisance or carrying on such trade or occupation, or keeping any such goods or merchandise, or owning or possessing or controlling such building, tent, structure, substance, tank, well or excavation, or owning or possessing such animal or tree, within a time to be fixed in the order concerned, within a time to be fixed in the order- (i) to remove obstruction or nuisance, or (ii) to desist from carrying on, or to remove or regulate in such manner as may be directed, such trade or occupation, or to remove such goods or merchandise, or to regulate the keeping thereof in such manner as may be directed; or (iii) to prevent or stop the construction of such building, or to alter the disposal of such substance; or (iv) to remove, repair or support such building, tent or structure, or to remove or support such trees; or (v) to fence such tank, well or excavation; or (vi) to destroy, confine or dispose of such dangerous animal in the manner provided in the said order; or, if he objects so to do, to appear before himself or some other Executive Magistrate subordinate to him at a time and place to be fixed by the order, and show cause, in the manner herein after provided, why the order should not be made absolute.

- (2) No order duly made by the Magistrate under this section shall be called in question in any civil Court.

Explanation- A 'public place' includes also property belonging to the State, camping ground and grounds left unoccupied for sanitary or re-creative purposes.

⁴⁷ Section 188 of the Indian Penal Code says- Whoever knowing that, by an order promulgated by a public servant lawfully empowered to promulgate such order, he is directed to abstain from a certain act, or to take certain order with certain property in his possession or under his management, disobeys such direction and if such disobedience causes or tends to cause danger to human life, health or safety, or causes or tends to cause a riot or affray, shall be punished with imprisonment for six months or fine which may extend to one thousand rupees or with both.

2. It is not a private dispute between different members of the public for which the proper forum is the civil court.

3. It is a case of great emergency of imminent danger to the public interest.

Section 133 of the Cr. P. C. deals with certain specific public nuisances and provides a summary remedy for their removal⁴⁸. But no period is prescribed within which the court could be moved under this Section for the removal of an evil in existence and each case will have to be regulated by its own circumstance⁴⁹. In order to invoke Section 133(1)(a), the nuisance has got to be public nuisance and then only it can be stated to affect the members of public and hence can be removed from the public place. The expression 'public place' as per the explanation includes also property belonging to the State. In *Ram Kishore v. State*⁵⁰ it has been held that a place in order to be public must be open to the public i.e. a place to which the public have access by right, permission, usage or otherwise. But Clause (b) of section 133 (1) is applicable only in such cases where the conduct of any trade or occupation, etc., is injurious to the health or physical comfort of the community. The word 'regulated' indicates that the court, instead of prohibiting the trade etc. completely, can regulate the same in such a way as not to become a nuisance. The scope of the provision as an instrument of pollution control came under scrutiny in several cases.

The object and purpose of this Section is essentially to prevent public nuisance and involves a sense of urgency in the sense that if the Magistrate fails to take recourse immediately irreparable damage would be done to the public. It applies when the nuisance is in existence. The proceedings under Part B of Chapter X are of a summary nature and intended to enable the Magistrate to deal with the cases of emergency and are not intended to settle private disputes between the different members of the public. They are not supposed to be used as a substitute for litigations in a civil court in order to settle a private dispute and if a person has any private right, which he wishes to be enforced, he should take recourse to the civil Courts. However, In *Krishna Gopal v. State of Madhya Pradesh*⁵¹ the Madhya Pradesh High Court has

⁴⁸ R.V. Kelkar, *Criminal Procedure* pg. 801 (Eastern Book Agency, 6th Edn., 2014).

⁴⁹ *Ibid.*

⁵⁰ 1973 Cri L J 1527 (HP).

⁵¹ 1986 Cri L J 396 (MP).

ordered the closure of the factory even though the contention of the defendant was that the inconvenience to the inmates of a house is not of public nuisance but only private in nature. The High Court observed:

“It is not the intent of the law that the community as a whole or large number of complainants should come forward to lodge their complaint or protest against the nuisance: that does not require any particular number of complainants. A mere reading of section 133 (1) of Cr.P.C. would go to show that the jurisdiction of sub-divisional magistrate can be invoked on receiving a report of a police officer or other information and on taking such evidence if any, as he thinks fit. These words are important. Even on information received the sub-divisional magistrate is empowered to take action in his behalf for either removal or regularising a public nuisance”⁵².

The Court further said that smoke and noise emanated from the glucose manufacturing factory is injurious to health and physical comfort of the community, and dismissed the revision petition filed by the defendant.

For defying the orders, even the head of the government department or public bodies can be prosecuted. It may be noted that section 133 of Cr.P.C. can be used even against statutory bodies like Municipalities, Corporations and other government bodies if they do any act or omission which causes public nuisance and air pollution. For example, in *Municipal Council, Ratlam v. Vardichand*⁵³, the residents of the Municipality used to suffer from stench and stink caused by open drains, effluents from alcohol plant flowing into streets and poor sanitation including open public excretion by nearby slum-dwellers. The residents moved the Magistrate under Section 133 of Cr. P.C. requiring the Municipality to do its duty towards the members of the public. The Magistrate issued directions to the Municipality to draft a plan for the removal of nuisance within a period of six months. The Municipality instead of complying with the order of the Magistrate, moved in appeal to Sessions Court which reversed the order. In further appeal, the High Court set aside the order of the Sessions Court and approved the Magistrate’s order. The Municipality went for further appeal to the Supreme Court. From Trial Court to Supreme Court, it took eight

⁵² *Ibid* at pg. 403.

⁵³ AIR1980 SC 1622.

years and the Municipality took the plea of “financial inability” in the Supreme Court. Justice Krishna Iyer declared that

“...the guns of section 133 go into action wherever there is public nuisance. The public power of the Magistrate under the Code is a public duty to the members of the public who are victims of the nuisance.’ If the order is defied or ignored, section 188, I.P.C. comes into penal play. It held that ‘section 133, Cr.P.C. read with the punitive temper of section 188 I.P.C. makes the prohibitory act a mandatory duty”.

The Court also pointed out that Article 47 of the Constitution of India makes it imperative that ‘steps are taken for the improvement of public health as amongst its primary duties.’ Despite legal provisions, there is very little effort at implementation. The issue of lack of implementation was brought up in *Almitra Patel’s*⁵⁴ case, where it was pointed out referring the judgement of *Dr. B.L Wadhera’s*⁵⁵ case pertaining to solid waste management in New Delhi, had not been complied with. One of the difficulties pointed out to the court was that even though the MCD and the NDMC Acts permit action being taken, inter alia, against persons who litter the city, sufficient number of judicial magistrates are not available for ensuring proper enforcement of the provisions of the said Acts. The court opined that the shortage of judicial magistrates can be easily overcome by the Government appointing suitable persons as Executive Magistrates under Section 20 or Special Executive Magistrates under section 21 of the Code of Criminal Procedure who can be empowered to deal with such minor offences under the provisions of the MCD and NDMC Acts. There are large number of retired government officials and ex-defence officers who have held responsible posts and are living in Delhi who, we are sure, will be willing to act as such Magistrates. Despite efforts at evolving innovative solutions, the formal sector continues to struggle with effective implementation of the primary laws that govern the sector.

Again, in *Avarachan v. Srinivasan*⁵⁶ it has been held by the Supreme Court that the omission of the SDM to draw up a preliminary order, which is *sine qua non* for initiating proceedings under section 133 of Cr. P. C. and without following

⁵⁴ *Almitra H.Patel v. Union of India*, (1998) 2 SCC 416.

⁵⁵ *Dr. B. L. Wadhera v. Union of India*, AIR 1996 SC 2969.

⁵⁶ (1996) 7 SCC 71.

procedure provided for under section 138 the order of SDM to permanently close down a quarry was not valid.

Almost all types of pollution can be controlled or removed by the District and Sub-Divisional Magistrates or by Magistrates specially empowered for the purpose, by exercising powers under Section 133 of the Cr. P. C., 1973. In *Deshi Sugar Mill v. Tupsi Kahar*⁵⁷ the Patna High Court held that the law of nuisance under section 133 Cr. P.C. would be applicable to pollution related cases also. The Court also recognized that the magistrate has the power to proceed against the discharge of effluents injurious to the health of the community.

In *Govind Singh v. Shanti Swaroop*⁵⁸ the Supreme Court upheld the Magistrate's order of demolition of the bakery causing air pollution and dismissed the special leave petition, relied on the findings of the magistrate believing him to have made a local inspection of the site. The Supreme Court captured the potentiality of the law of nuisance in the Criminal Procedure Code.

From the various case laws decided by the Apex court and different High Courts it is clear that the Section not only covers the cases of environmental pollution under the purview of public nuisance, it can also be referred in other matters such as creating obstruction by constructing an illegal building or a building which is in a condition that it is likely to fall causing injury to persons living etc. The bio-medical waste being one of the sources of environmental pollution causing water, air and land pollution can be brought under the purview of this Section. However, in spite of the existing laws, there was a need of specific legislations under which the pollution matters in general and bio-medical waste in particular could be properly dealt with.

6.2.3 The Water (Prevention and Control of Pollution) Act, 1974

The first important specific environmental law enacted by the Parliament is the Water (Prevention and Control of Pollution) Act, 1974. The Act provides for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, for the establishment, with a view to carrying out the

⁵⁷ AIR 1926 Pat 506.

⁵⁸ (1979) 2 SCC 267.

purposes aforesaid, of Boards for the prevention and control of water pollution and for conferring on and assigning to such Boards powers and functions relating thereto⁵⁹. It defines pollution⁶⁰ as ‘such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or it is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or of aquatic organisms’.

The main provisions dealing with the prevention and control of water pollution are under Chapter V of the Act particularly Section 21 which confer power on the State Pollution Control Board (SPCB) to take samples of effluents and procedure to be followed in connection therewith. Sub-Sections 3 to 5 of Section 21 deals with the procedures to be followed in this regard which *inter alia* provides for the service of notice, division of samples so collected in two parts in the presence of the occupier or his agent and placing the same in the container with mark and seal properly to be sent to the laboratory for analysis. It also lay down the power of Board under Section 33 to make application to courts for restraining apprehended pollution of water in streams or wells. Section 33-A confers power on the Board to issue direction and the closure, prohibition or regulation of any industry, operation or process or the storage or regulation of supply of electricity, water or any other service in case of non compliance of the direction.

Chapter VII of the Act deals with penal provisions, according to which whoever fails to comply with any order issued under clause (e) of Sub-Section (1) of Section 32 or any direction issued by a court under Sub-Section (2) of Section 33 or any direction issued under Section 33-A shall, in respect of each such failure and on conviction, be punishable with imprisonment for a term which shall not be less than one year and six months but which may extend to six years and with fine, and in case the failure continues, with an additional fine which may extend to five thousand

⁵⁹ Preamble to the Water (Prevention and Control of Pollution) Act, 1974.

⁶⁰ Section 2 (e) of the Water (Prevention and Control of Pollution) Act, 1974.

rupees for everyday during which such failure continues after the conviction for the first such failure⁶¹.

There are many instances where direct untreated bio-medical solid and liquid wastes are dumped into open drain or let out into municipal sewer causing hazardous effect upon health and environment. The health care institutions, right from the generation of bio-medical waste contributes to water pollution which continues till its disposal with or without treatment. The incinerators used for treating bio-medical waste shall come under the purview of the Act as it discharges trade effluents.

Under this Act, duties have been conferred on the occupier⁶² who has control over the affairs of the factory or the premises which includes any substance whether liquid or solid. The liquid waste including bio-medical waste howsoever small in proportion is to be treated properly and then disposed of through outlet to the Municipal sewers. If the untreated bio-medical waste is or let out into municipal sewer⁶³ and stream⁶⁴, it causes water pollution.

The Act also prevents water pollution through bio-medical waste by prohibiting on use of stream or well for disposal of polluting matter etc⁶⁵. The Act also restricts on new outlets⁶⁶ and new discharges when any step to establish any industry, operation or includes process, or any treatment and disposal system (for e.g., incineration plant) which is likely to discharge sewage⁶⁷ or trade effluent⁶⁸ into a

⁶¹Section 41(2) of the Water (Prevention and Control of Pollution) Act, 1974.

⁶²Section 2(d) of the Water (Prevention and Control of Pollution) Act, 1974 Ins. by the Amendment of the Act 44 of 1978. "occupier" in relation to any factory or premises, means the person who has control over the affairs of the factory or the premises, and includes, in relation to any substance, the person in possession of the substance.

⁶³Section 2(gg) of the Water (Prevention and Control of Pollution) Act, 1974- "sewer" means any conduit pipe or channel, open or closed, carrying sewage or trade effluent

⁶⁴Section 2(j) of the Water (Prevention and Control of Pollution) Act, 1974- "stream" includes- (i) river; (ii) water course (whether flowing or for the time being dry); (iii) inland water (whether natural or artificial); (iv) sub-terranean waters; (v) sea or tidal waters to such extent or, as the case may be, to such point as the State Government may, by notification in the Official Gazette, specify in this behalf.

⁶⁵Section 24 of the Water (Prevention and Control of Pollution) Act, 1974- Prohibition on use of stream or well for disposal of polluting matter, etc.

⁶⁶Section 2(dd) of the Water (Prevention and Control of Pollution) Act, 1974- "outlet" includes any conduit pipe or channel, open or closed, carrying sewage or trade effluent or any other holding arrangement which causes or is likely to cause, pollution.

⁶⁷Section 2(g) of the Water (Prevention and Control of Pollution) Act, 1974- "sewage effluent" means effluent from any sewerage system or sewage disposal works and includes sullage from open drains.

⁶⁸Section 2(k) of the Water (Prevention and Control of Pollution) Act, 1974- "trade effluent" includes any liquid, gaseous or solid substance which is discharged from any premises used for carrying on any industry, operation or process, or treatment and disposal system, other than domestic sewage.

stream or well or sewer or on land and before the Act was commences, it should resume back to the present law and abide by the existing law⁶⁹.

6.2.4 The Air (Prevention and Control of Pollution) Act 1981

The Air Act is passed with a view to prevent, control and abatement of air pollution and to maintain good quality of the air. The Act was modelled on the Water Act and it provides a very wide definition of 'air pollutant' under Section 2(a) to mean 'any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. This definition has been inserted with a view to get a clear idea regarding the meaning of the 'air pollution'⁷⁰ according to which the presence in the atmosphere of any air pollutant is air pollution. The Act empowered the State Governments to designate air pollution areas and to prescribe the type of fuel to be used in these designated areas. The definition of air pollutant brings within its fore the matter connected with the bio-medical waste also as it has been seen that the improper management of bio-medical waste also causes severe environmental problems in the field of atmosphere by polluting the air. The bio-medical waste is one of the major contributors to the air pollution. It produces mainly two kinds of air pollution: indoor air pollution and outdoor air pollution. The biological, chemical and radioactive substances present in such waste, after mixing in the air causes an ill effect in the environment. Pathogens present in the waste can enter and remain in the air for a long period in the form of spores or as pathogens. The indoor air pollution caused due to the above chemicals from poor ventilation may result diseases like Sick Building Syndrome (SBS)⁷¹ etc.

Outdoor air pollution can be caused by pathogens. The bio-medical waste containing pathogens, if without any pre-treatment transported outside the institution or if it is dumped in open areas, can enter into the atmosphere. Chemical pollutants that cause outdoor air pollution have two major sources viz. open burning and

⁶⁹ Section 26 of the Water (Prevention and Control of Pollution) Act, 1974.

⁷⁰ Section 2 (b) of the Air (Prevention and Control of Pollution) Act, 1981.

⁷¹ B. Ramesh Babu, A.K. Parande, *et. al.*, "Management of Biomedical Waste in India and Other Countries: A Review" Vol. 4 Journal of International Environmental Application & Science pg. 67 (2009).

incinerators. Open burning of bio-medical waste is the most harmful practice. When inhaled can cause respiratory diseases. Certain organic gases such as dioxins and furans are carcinogenic. The improper combustion emits air pollutants like dioxins, furans, particulate matter, fly ashes etc. and that cause severe air pollution. Research and radio-immunoassay activities may generate small quantities of radioactive gas. Gaseous radioactive material should be evacuated directly to the outside⁷².

Therefore, the need of control equipment⁷³ that are essential to control emission⁷⁴ of the industrial plant⁷⁵ arises and the Act has included this terms considering its effectiveness to control and prevent air pollution. Therefore, it is made mandatory duty on the occupier to take notice of the regulations and establish the industrial plant and it shall be governed under State or Central Government as the case may be. The Act also lay down certain restrictions⁷⁶ on the use of certain industrial plants in an air pollution control area which is similarly applicable to the bio-medical waste incinerator plant as all required permission must be obtained under Air Act to set up health care industry. The industrial set up is also required to follow certain standards as laid down by State Board⁷⁷.

Regarding penalties and procedure⁷⁸ the Act states that if there is a failure to comply with the provisions of Section 21 or Section 22 or with the directions issued under Section 31A, the occupier is held liable and shall be punishable with imprisonment for a term of one year or may extend to six years and with fine and in case of future continuance, additional fine of five thousand rupees for every day may be imposed and if there is continuation of violation, the imprisonment shall be for two

⁷² *Ibid.*

⁷³Section 2 (i) of the The Air (Prevention and Control of Pollution) Act 1981-“control equipment” means any apparatus, device, equipment or system to control the quality and manner of emission of any air pollutant and includes any device used for securing the efficient operation of any industrial plant, under Air Act 1981.

⁷⁴Section 2(j) of the The Air (Prevention and Control of Pollution) Act 1981- “emission” means any solid or liquid or gaseous substance coming out of any chimney, duct or flue or any other outlet under Air Act 1981.

⁷⁵Section 2(k) of the The Air (Prevention and Control of Pollution) Act 1981- “industrial plant” means any plant used for any industrial or trade purposes and emitting any air pollutant into the atmosphere, under Air Act 1981.

⁷⁶Section 21 of the The Air (Prevention and Control of Pollution) Act 1981.

⁷⁷Section 22 of the The Air (Prevention and Control of Pollution) Act 1981- Persons carrying on industry, etc., and to allow emission of air pollutants in excess of the standard laid down by State Board-No person operating any industrial plant, in any air pollution control area shall discharge or cause or permit to be discharged the emission of any air pollutant in excess of the standards laid down by the State Board under clause (g) of sub-section (1) of section 17.

⁷⁸ Penalties and Procedure (Chapter VI) of the Air (Prevention and Control of Pollution) Act, 1981.

years with fine. In case the emission from incineration plant exceeds the standard, it is also subject to penal provision.

6.2.5 The Environment (Protection) Act, 1986

One of the most important specific environmental legislation that deals with all aspects of environmental pollution is the Environment (Protection) Act, 1986⁷⁹. The Act is umbrella legislation and has been passed with the aim of covering all cases of environment pollution. The Act provides a framework for the coordination of central and state authorities established under the Water (Prevention and Control) Act, 1974 and Air (Prevention and Control) Act, 1981. Under this Act, the Central Government is empowered to take measures necessary to protect and improve the quality of the environment by setting standards for emissions and discharges; regulating the location of industries; management of hazardous wastes and protection of public health and welfare. The Central Government has also empowered to issue from time to time, notifications and guidelines under the Environment (Protection) Act relating to and connected with the environment. The Act empowers the Ministry of Environment and Forests to enact Rules under it that would govern the management of all kinds of waste in India. The framing of bio-medical waste Rule under this Act is an attempt towards eradicating such problem. The Act is the outcome of India's international commitment made at the United Nations Conference on the Human Environment held at Stockholm in June 1972.

The Act defines the term 'environment'⁸⁰ to include water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property. Since the subject of the research is to deal with various aspects of bio-medical waste, it is important to understand the definition of the various terms explained under the Act having relevancy with it. The term 'hazardous substance'⁸¹ means any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro-organism, property or the environment. It also defines 'environmental pollutant' under Sec. 2(b) so as to mean any solid, liquid or gaseous substance present

⁷⁹ Act No. 29 of 1986

⁸⁰ Section 2(a) of the Environment (Protection) Act, 1986.

⁸¹ Section 2 (e) of the Environment (Protection) Act, 1986.

in such concentration as may be, or tend to be, injurious to environment. The above definitions cover a wide range of environment aspect which is the result of the deteriorating condition of the environment. Thus, anything that pollutes the water, air and land has to be checked, prevented and controlled. The scheme and enforcement of law has to be framed with such objective in mind. The legislative intent in framing these expressions liberally is indicative of the fact that the law has to be applied stringently to all such subjects and matters including the bio-medical waste which are likely to be environmental pollutants or hazardous substances which could cause harm to human beings and other living creatures etc. as well⁸².

Section 2(d) defines the term 'handling'. It means any substance and its manufacture, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale. The substance or preparation which is liable to cause harm to any living being, property or the environment and it need not by itself be harmful. If the effect produced by it is harmful, it is specified as hazardous substance. Any factory or a premises which is controlled by any person and who has possession of the substance is stated to be an 'occupier'⁸³. These definitions have great impact on bio-medical waste management as all these components are part of it. Under the Act the Central Government is empowered under Section 3 (1) to take necessary steps as it deems fit for the purpose of protecting and improving the quality of environment and preventing environmental pollution. The Central Government is also authorised⁸⁴ to set new standards rationally for the quality of environment in its various aspects and also to sets out standards for the emission or discharge of environmental pollutants from various sources which also include the health care institutions. It also imposes restrictions, obligations, safeguarding measures, preventive actions, and remedies for all the operating industries. Apart from this it also lay down provisions for carrying out examination, sponsoring, investigations, research, inspection, establishments of laboratories and institutions, preparations of manuals, guides, codes etc. such other things in order to prevent, control and abate environmental pollution. The Act also specifies power to give directions under Section 5 on the Central Government relating to closure, prohibition or regulation of

⁸² Yuvraj Dilip Patil, "Disposal of Bio-medical Waste in India" Vol. 4 Journal of Krishna Institute of Medical Sciences University pg. 189 (Jan-Mar 2015).

⁸³ Section 2 (f) of the Environment (Protection) Act, 1986.

⁸⁴Section 3 (2) of the Environment (Protection) Act, 1986.

any industry, operation or process etc. Sections 7 to 17 lay down the provisions relating to prevention, control and abatement of environmental pollution and also punishment⁸⁵ there under. Section 8 signifies that the persons handling hazardous substances have to comply with procedural safeguards. Mention should also be made of Section 25 which deals with the power to make Rules on various environmental issues for the prevention and control the same. The passing of bio-medical waste Rules under the Act has proved an effective measure undertaken by the Ministry of Environment and Forest to meet the challenge.

Highlighting on having such umbrella legislation the Delhi High Court in *Delhi Medical Association v. Union of India*⁸⁶ has clearly stated that the base for any environmental provision is the Environment (Protection) Act, 1986. Therefore, all environmental laws shall comply with the Act and it is equally applicable to bio-medical waste Rules. The bio-medical waste is, of course hazardous if not properly managed. It should not be taken lightly that if express/direct provisions is not found in the Act it is not applicable to the bio-medical waste, instead the health care establishments are responsible for following the standards laid in the Act and in Environment (Protection) Rules, 1986⁸⁷ framed under it.

The Rules, 1986 plays an important role in the management of bio-medical waste. The main provision that attracts is Rule 3, which sets out the standards for emission or discharge of environmental pollutants. It clearly notifies that specific industries should follow the standards for emission or discharge of environmental pollutants as specified in Schedule I to IV within one year. Therefore, if proper collection, segregation, storage, treatment and final disposal of such waste involving systematic procedures are not taken it would be in violation of emission or discharge standards provided by the Rules which would cause environmental impact.

⁸⁵ Section 15 of the Environment (Protection) Act, 1986 provides for imposition of penalty of Rupees one lakh and imprisonment up to five years or both for any violation of the provisions. It also provides for higher penalty in case of continuous violation.

⁸⁶ AIR 2009 Delhi 163.

⁸⁷ Section 6 of the Environment (Protection) Act, 1986.

6.2.6 The Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987⁸⁸

Healthcare establishments, nowadays, generate enormous amount of radioactive wastes⁸⁹ consisting of radioactive substances or radioactive materials⁹⁰ due to the use of radioisotopes for diagnostic and therapeutic applications. The bulk of the hospital radioactive waste gets generated in the department of nuclear medicine. Most of the radioactive waste is liquid, with lesser amount of solid and minimal gaseous. The solid waste containing traces of radioactivity is in the form of syringes, needles, cotton swabs, vials, contaminated gloves and absorbent materials. Clothing and utensils of patients administered high doses of radioisotopes like I-131 constitute the solid radioactive waste material⁹¹. Such radioactive elements are very hazardous in nature and prove fatal when come in direct contact with the persons involved in its handling. Therefore, safe disposal⁹² of the radioactive waste is a vital component of the overall management of the hospital waste. An important objective in radioactive waste management is to ensure that the radiation exposure should not exceed the prescribed safe limits. Keeping the exposure levels within the prescribed limits reduces the short term and long-term effects of ionizing radiations on humans, besides reducing its negative impact on environment.

The management of radioactive waste involves two stages; collection and disposal. The radioactive waste should be identified and segregated within the area of work. Foot operated waste collection bins with disposable polythene lining should be used for collecting solid radioactive waste and polythene carboys for liquid waste. Collecting radioactive waste in glassware should be avoided. Each package is monitored and labeled for the activity level before deciding upon the mode of disposal. Some hospitals that have incinerators and permission to dispose of

⁸⁸ As per Sub Section I cl. (i) of sub section (2) of Section 30 and Cl.(b) of Sub-Section (1) of Section 17 of the Atomic Energy Act 1962 (33 of 1962).

⁸⁹ Under Rule 2(xxii) of the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987 radioactive waste means any waste material containing radionuclides in quantities or concentrations as prescribed by the competent authority by notification in the official gazette.

⁹⁰ Rule 2(i) of the Atomic Energy Act, 1962- means any substance or material which spontaneously emits radiation in excess of the levels prescribed by notification by the Central Government.

⁹¹ Shoukat Khan, Syed, Reyaz Ahmad, *et. al.*, "Radioactive Waste Management in a Hospital" Vol. 4 International Journal of Health Science pg. 39 (Jan., 2010).

⁹² 'Safe disposal' as per Rule 2(x) of the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987 means release of any material to the environment in a manner leading to loss of control over the future disposition of the radionuclides contained therein and includes emplacement of waste materials in a repository.

combustible radioactive waste through incineration may also segregate combustible radioactive waste from non-combustible waste. When two different isotopes of different half-lives like Tc-99m and I-131 are used, separate waste collection bags and bins should be used for each. Each bag or bin must bear a label with name of the isotope, level of activity and date of monitoring⁹³.

The following are the relevant Rules that govern the disposal of radioactive waste that are pertinent to mention. Under Rule 3 no person shall dispose of radioactive waste –

- (a) unless he has obtained an authorization from the competent authority under these rules;
- (b) in any manner other than in accordance with the terms and conditions specified in the authorisation issued under these rules;
- (c) in any location different from those specified in the authorisation;
- (d) in quantities exceeding those specified in the authorisation.

Special provisions have been lay down under Rule 15 for the installation or institution⁹⁴ hospitals and Tracer Research Laboratories according to which

(a) persons using small amounts of radioisotopes of very short effective half life (such as in medical practice and tracer applications) may submit their application in Form V for authorisation to dispose of radioactive waste and

(b) without prejudice to the generality of these rules, a person thus authorised may dispose of wastes containing short lived radioisotopes, contaminated materials and contaminated effluents, in accordance with the procedures and conditions laid down in the Schedule.

The Schedule specifies that institutions such as hospitals and tracer research laboratories, handling small quantities of radioisotopes of short effective half life⁹⁵

⁹³Shoukat Khan, Syed, Reyaz Ahmad, *et. al.*, “Radioactive Waste Management in a Hospital” Vol. 4 International Journal of Health Science pg. 39 (Jan., 2010).

⁹⁴ ‘Institution’ as per Rule 2(xvi) of the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987 means any location wherein the processes incidental to the waste generation, conditioning, storage and disposal are carried out.

⁹⁵ Long half-life waste (half-life more than a month) and short half-life waste (half-life less than a month).

may, after obtaining the authorisation, under rule 3, undertake disposal of radioactive waste in accordance with the following procedures:

- a. The disposal of radioactive waste by release into sanitary sewerage system provided the waste is readily soluble or dispersible in water and the maximum quantity of radioactive material released in the sanitary sewerage system is less than the quantity prescribed in Table I of this Schedule.
- b. The disposal of solid radioactive waste must be by an authorised person which should be buried into pits prepared in an exclusive burial ground located in an isolated area. The total activity in the wastes buried in any one pit of the burial ground should not exceed the limits specified in Table 2 of this Schedule.
- c. Incineration of Radioactive Waste. An authorised person may undertake incineration of radioactive wastes, including incineration of radioactive animal carcasses, provided the competent authority is duly satisfied with regard to the design of the incinerator, emissions of the incinerator and is suitable for the intended operations. Up-to-date records should be maintained of the incineration operations indicating the names of radionuclides and their amounts finally disposed of in gaseous, liquid and solid form.

Besides this, every hospital should have a designated Radiation Safety Officer (RSO) under the Radiation Protection Rules, 1971 who oversees all aspects of radiation safety including radioactive waste management. The RSO co-ordinates such measures in accordance with guidelines prescribed by the International Commission on Radiation Protection and the national regulatory body.

6.2.7 The Municipal Solid Wastes (Management and Handling) Rules 2000⁹⁶

Municipal Solid Waste (MSW) is the trash or garbage that is discarded day to day in a human settlement. Since majority of the health care institutions are located within the municipal area their waste management naturally has a close linkage with

⁹⁶ Government of India, Notification No. S.O. 908 (E), Ministry of Environment and Forests, dated September 25, 2000, Extra., Part II, Section 3(ii), dated 3rd October, 2000, 24-49, No. 648 [F. No.17-2/95 HSMD]

the municipal system. Moreover, since it would not be possible for each and every health care institution to have its own full-fledged treatment and disposal system for bio-medical waste, there would be need for common treatment and disposal facilities under the ownership/supervision/guidance of the civic authority. The Rules lay down the steps to be taken by all municipal authorities to ensure management of solid waste (including the solid waste generated by the health care institutions) according to best practice and are applicable to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solids.

The Rules contains four Schedules. Schedule I of the Rules is relating to implementation Schedule. Schedule II of the Rules mentioned the specifications in connection with the collection, segregation, storage, transportation, processing and disposal of the waste. Under Schedule III of the Rules specifications for land filling indicating site selection, facilities at the site, pollution prevention, water quality monitoring, ambient air quality monitoring, plantation at landfill site, closure of landfill site and post care have been laid down and Schedule IV of the Rules indicate waste processing options including standards for composting, treated leachates and incinerations.

In the definition it has shown concern toward bio-medical waste. Under Rule 3(xv) 'municipal solid waste' is defined which includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes. Therefore, the Rules have taken care of treated bio-medical waste to include in the municipal solid wastes and are disposed of with municipal waste after properly treating it.

Under the Schedule II⁹⁷, criteria (iv) has clearly mentioned that bio-medical waste and industrial wastes shall not be mixed with municipal solid wastes and such waste shall follow the rules separately specified for the purpose. The Schedule notifies that bio-medical waste shall not be mixed in municipal dustbins or openly dumped in the municipal area and if any negligence or nuisance is committed by dumping such wastes, it would be violating the Rules and action would be taken

⁹⁷ Rules 6(1) and (3), 7(1) of the Municipal Solid Wastes (Management and Handling) Rules 2000.

accordingly. Necessary precautions shall be taken to minimise nuisance of odour, flies, rodents, bird menace and fire hazard⁹⁸.

Under Schedule III⁹⁹ which deals with specifications for landfill sites, regarding site selection, para 6 has mentioned that bio-medical waste shall be disposed off in accordance with the Bio-Medical (Management and Handling) Rules, 1998. This implies that such wastes are not to be dumped with municipal solid waste land fill sites and any act against the Rules shall be offensive and concerned authorities shall have the right to take action against it.

Form II read with Rule 4(4) of the Rules on the other hand requires the submission of annual report by the Municipal Authority conferred a duty on such authority also to submit report relating to number of hospitals /clinics under the control of the Corporation, what methods are followed for the disposal of bio-medical waste, number of private nursing homes are operating in the city etc.

6.2.8 The Batteries (Management and Handling) Rules, 2001

The Batteries (Management and Handling) Rules, 2001 apply to the handling of batteries and their components. Batteries¹⁰⁰ are defined under the rules to include lead acid batteries that contain metal and are a source of electrical energy. The Batteries Rules apply to every manufacturer¹⁰¹, importer¹⁰², reconditioner¹⁰³, assembler¹⁰⁴, dealer¹⁰⁵, recycler¹⁰⁶, auctioneer¹⁰⁷, bulk consumer (like departments,

⁹⁸ Para 3 (ii), Schedule IV of the Municipal Solid Wastes (Management and Handling) Rules 2000.

⁹⁹ Rules 6(1) and (3), 7(2) of the Municipal Solid Wastes (Management and Handling) Rules 2000.

¹⁰⁰ As per Rule 2(e) of the Batteries (Management and Handling) Rules, 2001 defines 'battery' as lead acid battery which is a source of electrical energy and contains lead metal.

¹⁰¹ As per Rule 3(l) of the Batteries (Management and Handling) Rules, 2001 'manufacturer' in relation to any factory manufacturing lead acid batteries or components thereof means a person or Chief Executive Officer (CEO) of the company who has control over the affairs of the factory or the premises for sale and collection of lead acid batteries or components thereof.

¹⁰² As per Rule 3(k) of the Batteries (Management and Handling) Rules, 2001 'importer' means a person who imports new lead acid batteries or components containing lead thereof for the purpose of sale.

¹⁰³ As per Rule 3(n) of the Batteries (Management and Handling) Rules, 2001 'reconditioner' means a person involved in repairing of lead acid batteries for selling the same in the market.

¹⁰⁴ As per Rule 3(b) of the Batteries (Management and Handling) Rules, 2001 defines 'assembler' as a person who manufacture lead acid batteries by assembling various components.

¹⁰⁵ As per Rule 3(i) of the Batteries (Management and Handling) Rules, 2001 'dealer' means a person who sells and receives lead acid batteries or components thereof to and from the consumers or other

organisations purchasing more than 100 batteries) and consumer. The scope of duties of each type of entity is provided in detail to ensure collection, recycling, transportation and sale of batteries. For instance, Rule 10 mandates that all consumers deposit used batteries with dealer, manufacturer, importer, assembler, recycler, re-conditioner or designated collection centres have specific responsibilities¹⁰⁸ under the rules including stated procedures for collection, recycling and transportation¹⁰⁹.

Under the Batteries Rules, SPCBs are responsible for ensuring that regulated parties comply with the rules and with the conditions imposed by their registrations. SPCBs must file annual compliance status reports to the CPCB by April 30 each year¹¹⁰. The Joint Secretary, Ministry of Environment and Forests (or any officer designated by the Ministry or other agency) will ensure that recyclers possess appropriate facilities, technical capabilities, and equipment to recycle used batteries and dispose of any hazardous wastes generated during the recycling process.

A recycler must register with an SPCB for a five-year license. To obtain a registration as a battery recycler, an applicant must possess consents under the Air and Water Act, valid authorisation under the Hazardous Wastes Rules, registration with their District Industries Centre, and documentation of their installed capacity. Noncompliance with the Rules also attracts punishment under the Environment (Protection) Act, 1986¹¹¹, whereby the person-in-charge may be imprisoned for up to five years and/or fined up to rupees one lakh and in case the failure or contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention.

dealers or retailers on behalf of the manufacturers, importers, assemblers and reconditioners or to otherwise.

¹⁰⁶As per Rule 3(o) of the Batteries (Management and Handling) Rules, 2001 'recycler' means an occupier who processes used lead acid batteries or components thereof for recovering lead.

¹⁰⁷As per Rule 3(d) of the Batteries (Management and Handling) Rules, 2001 'auctioneer' means a person(s) who auctions used lead acid batteries or components thereof.

¹⁰⁸For example, Rule 4 (of manufacturer, importer, assembler etc.), Rule 7 (of dealer), Rule 8 (of recycler), Rule 10 (of consumer or bulk consumers), etc.

¹⁰⁹Rule 2(I), Rule 2(k), Rule 2(b), Rule 2(n), Rule 4 of the Batteries (Management and Handling) Rules, 2001.

¹¹⁰Rule 12 of the Batteries (Management and Handling) Rules, 2001.

¹¹¹Section 15 of the Environment (Protection) Act, 1986.

6.2.9 The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008

Improper disposal of hazardous waste may pose serious risks to human health and the environment. For example, waste that is disposed of improperly may leach into the groundwater, where they may cause long term contamination of a region's water supply. Contamination due to improper disposal of hazardous waste can be harmful if untreated waste flows into open drains and enters water distribution systems. At the same time, exposure to hazardous waste through consumption, inhalation of polluted air or through direct contact with skin may cause many acute and long term health risks. These threats vary greatly depending on the type of hazardous waste at issue, but may include carcinogenesis, reproductive abnormalities, and central nervous system disorders and so on.

The Hazardous Wastes (Management and Handling) Rules, 1989, is the first set of Rules relating to hazardous wastes and after few amendments (in the year 2000 and 2003), and in the course of time, new Rules has been replaced by The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.

It is important to note that there are certain wastes that are excluded from the definition of hazardous waste. These include wastes covered under the Water Act, Air Act, Municipal Solid Wastes (Management & Handling) Rules, Batteries (Management and Handling) Rules, Bio-Medical Waste (Management and Handling) Rules, and Merchant Shipping Act¹¹².

Health care waste is a source of generation of hazardous biomedical waste. Hazardous wastes refer to wastes that may, or tend to cause adverse health effects on the ecosystem and human beings. These wastes pose present or potential risks to human health or living organisms, due to the fact that they are non-degradable or persistent in nature, can be biologically magnified, highly toxic and even lethal at very low concentrations.

¹¹²Maresh Menon, Manjeri Subin *et. al.*, "Enforcing Hazardous Waste Rules in India: Strategies and Techniques for Achieving Increased Compliance" Environmental Law Institute pg. 9 Washington D.C., (2014).

Exposure to hazardous healthcare waste/BMW can result in disease or injury. The hazardous nature of healthcare waste may be due to one or more of the following characteristics:

1. it contains infectious agent;
2. it is genotoxic;
3. it contains toxic or hazardous chemical or pharmaceuticals;
4. it is radioactive;
5. it contains sharps.

Although the HW Rules do not apply directly to BMW but as it consists of hazardous wastes in it and the regulation for it is important criteria and therefore those hazardous wastes are termed and governed under this Rule and help to abate pollution caused due to hazardous wastes present in the BMW.

According to the HW Rules, 2003, 'hazardous waste'¹¹³ means any waste which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances, and shall include wastes listed in the Schedules¹¹⁴. Under the Explanation to Rule 3 (14), all wastes mentioned in column (3) of Schedule 1 are hazardous wastes irrespective of concentration limits given in Schedule-2 except as otherwise indicated and Schedule 2 shall be applicable only for wastes or waste constituents not covered under column (3) of Schedule -1.

The Schedule-I (a) has listed nearly eighteen categories of wastes. Some of this hazardous wastes like lead, copper, zinc, chromium, mercury, heavy metals, laboratory chemicals, phenols, incineration ash, date expired, discarded and off specification drugs/pharmaceuticals, sludge from wet scrubbers, lead acid from waste treatment processes, e.g. incineration, distillation etc. can be found in the BMW and hence it is important to refer some of the important provisions of this Rules having connection with Bio-Medical Waste.

¹¹³ Rule 3 (14) of the Hazardous Waste Rules, 2003.

¹¹⁴ (a) wastes listed in column (3) of Schedule-1; (b) wastes having constituents listed in Schedule -2 if their concentration is equal to or more than the limit indicated in the said Schedule; and (c) wastes listed in Lists 'A' and 'B' of Schedule -3 (Part-A) applicable only in case(s) of import or export of hazardous wastes in accordance with rules 12, 13 and 14 if they possess any of the hazardous characteristics listed in Part-B of Schedule 3".

The Hazardous Waste Rules specifies the ‘operator of facility’¹¹⁵ who engaged in activities from collection to disposal of hazardous waste and also specifies the responsibility of the occupier and operator of a facility under the Rule 4 relating to:

- Handling generated hazardous waste in a safe and “environmentally sound” manner;
- Taking all adequate steps to contain contamination and prevent accidents; and
- Providing employees with training, equipment and information for their safety.

Under Rule 4(3) it also laid emphasis on taking all steps to ensure that the wastes listed in schedules-1, 2 and 3 are properly handled, and disposed of without any adverse effects to the environment.

The operator of a treatment, storage, and disposal facilities is responsible for its ‘safe and environmentally sound operation’¹¹⁶ In addition, both occupiers and operators have the general responsibility to ‘take all the steps, wherever required, for reduction and prevention of the waste generated or for recycling or reuse...’ They must also comply with all the conditions set out in their authorization¹¹⁷.

Apart from these general responsibilities, the Hazardous Wastes Rules also set out specific responsibilities in handling hazardous waste. This includes responsibilities regarding packaging and labeling hazardous waste which specifies that the occupiers, operators, and recyclers must ensure that hazardous wastes are properly packaged and labeled for their safe handling and storage.¹¹⁸ Occupiers, recyclers, re-processors, re-users, and operators of facilities may only store hazardous waste for 90 days.¹¹⁹ Any accidents involving hazardous waste must be reported ‘immediately’ to the relevant SPCB¹²⁰.

Rule 4A specifies the duty of the occupier and operator of facility to take adequate steps while handling hazardous waste containing contaminants and prevent accidents and limit their consequences on human and the environment. It also

¹¹⁵ Rule 3(28) of the Hazardous Waste Rules, 2003.

¹¹⁶ Rule 18(4) of the Hazardous Waste Rules, 2003.

¹¹⁷ Rule 5(8) of the Hazardous Waste Rules, 2003.

¹¹⁸ Rule 19 of the Hazardous Waste Rules, 2003.

¹¹⁹ Rule 7(1) of the Hazardous Waste Rules, 2003.

¹²⁰ Rule 24 of the Hazardous Waste Rules, 2003.

specifies duties to provide information, training and equipment necessary to ensure the safety of persons working on the site.

The Hazardous Wastes Rules set out responsibilities under Rules 4 and 9 for various actors in the disposal and transport of hazardous waste. These include some general responsibilities for occupiers, who must:

- Send or sell hazardous waste only to a registered recycler or an authorized disposal facility;
- Transport hazardous waste in accordance with the rules; and
- Provide required information to an operator of a treatment, storage and disposal facilities.

The rules also set out specific responsibilities with respect to the disposal and transport of hazardous waste. As a general matter, hazardous waste may only be ‘collected, treated, re-cycled, re-processed, stored or disposed of’ at facilities authorized by an SPCB.¹²¹

The Hazardous Wastes Rules address transport:

- within a state;
- across state lines; and
- across country lines.

For the transport of hazardous waste within a state, the rules set out particular procedures that must be followed. These procedures include properly packaging and labeling hazardous wastes before they are transported¹²². Hazardous waste must then be transported in accordance with all relevant rules¹²³. This includes preparing a manifest, which must be forwarded to, among others, the SPCBs¹²⁴.

6.2.10 The Plastic Waste Management¹²⁵ Rules, 2016¹²⁶

The Rules shall apply to every waste generator, local body¹²⁷, Gram Panchayat, manufacturer¹²⁸, importers¹²⁹ and producer¹³⁰. Earlier the application of

¹²¹ Rule 5(2) of the Hazardous Waste Rules, 2003.

¹²² Rule 19 of the Hazardous Waste Rules, 2003.

¹²³ Rule 20(1) of the Hazardous Waste Rules, 2003.

¹²⁴ Rules 21 of the Hazardous Waste Rules, 2003.

¹²⁵ Handling included in the word ‘Management’.

¹²⁶ Ministry of Environment, Forest & Climate Change, Notification No. S.O. 782(E), the 18th March, 2016, Published in the Gazette of India, Part-II, Section-3, Sub-section (i).

the Rules was confined only to the Municipal area, thus under the existing Rules 2016 importers are brought since importing is also a route of bringing plastic¹³¹ carry bags¹³²/ multilayered packaging¹³³ to the country. The jurisdiction has been extended to rural area also since plastic are being used in the rural areas also. The Rules increases thickness of plastic carry bags from 40 to 50 micron and stipulation 50 micron thickness for plastic sheets will likely to increase about 20% cost hence, the tendency to provide free carry bags will come down and the collection by the waste pickers¹³⁴ also increase to some extent.

Rule 4 lay down several conditions to be fulfilled by the manufacture, importer, stocking, distribution, sale and use of carry bags, plastic sheets or like, or cover made of plastic sheet and multilayered packaging such as:

¹²⁷ As per Rule 3(v) of the Plastic Waste Management Rules, 2016 ‘local body’ means urban local body with different nomenclature such as municipal corporation, municipality, nagarpalika, nagarnigam, nagarpanchayat, municipal council including notified area committee (NAC) and not limited to or any other local body constituted under the relevant statutes such as gram panchayat, where the management of plastic waste is entrusted to such agency

¹²⁸ As per Rule 3(m) of the Plastic Waste Management Rules, 2016 ‘manufacturer’ means and include a person or unit or agency engaged in production of plastic raw material to be used as raw material by the producer.

¹²⁹ As per Rule 3(k) of the Plastic Waste Management Rules, 2016 ‘importer’ means a person who imports or intends to import and holds an Importer - Exporter Code number, unless otherwise specifically exempted

¹³⁰ As per Rule 3(s) of the Plastic Waste Management Rules, 2016 ‘producer’ means persons engaged in manufacture or import of carry bags or multilayered packaging or plastic sheets or like, and includes industries or individuals using plastic sheets or like or covers made of plastic sheets or multilayered packaging for packaging or wrapping the commodity.

¹³¹ As per Rule 3(o) of the Plastic Waste Management Rules, 2016 ‘bringing plastic’ means material which contains as an essential ingredient a high polymer such as polyethylene terephthalate, high density polyethylene, Vinyl, low density polyethylene, polypropylene, polystyrene resins, multi-materials like acrylonitrile butadiene styrene, polyphenylene oxide, polycarbonate, Polybutylene terephthalate.

¹³² As per Rule 3© of the Plastic Waste Management Rules, 2016 ‘carry bag’ means bags made from plastic material or compostable plastic material, used for the purpose of carrying or dispensing commodities which have a self carrying feature but do not include bags that constitute or form an integral part of the packaging in which goods are sealed prior to use.

¹³³ As per Rule 3(n) of the Plastic Waste Management Rules, 2016 ‘ multilayered packaging’ means any material used or to be used for packaging and having at least one layer of plastic as the main ingredients in combination with one or more layers of materials such as paper, paper board, polymeric materials, metalised layers or aluminium foil, either in the form of a laminate or co-extruded structure.

¹³⁴ As per Rule 3(z) of the Plastic Waste Management Rules, 2016 ‘waste picker’ means individuals or agencies, groups of individuals voluntarily engaged or authorised for picking of recyclable plastic waste.

- carry bags and plastic packaging shall either be in natural shade which is without any added pigments or made using only those pigments and colourants which are in conformity with Indian Standard.
- Carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff.
- Carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness.
- Recycling of plastic waste shall conform to the Indian Standard etc.

The use of plastic in health care establishment is an important aspect and it is used in abundance. Plastic commodities¹³⁵ like catheters, tubes, pharmaceutical products are mostly packed in plastic containers, also gloves, syringes etc. are made out of plastics so on and so forth. The practice of using plastic and related commodities is rapidly growing in health care system. These plastics are effectively growing in health care system due to transparency, low cost, high resale value, and low infection rate with single use. To make effective check the Rules under Rule 8 imposes responsibilities of waste generators¹³⁶ including institutional generators, event organizers who shall not litter the plastic waste¹³⁷ instead after segregate the waste to be handover to authorized agency. All institutional generators of plastic waste shall segregate and store the waste generated by them in accordance with the Municipal Solid Waste (Management and Handling) Rules, 2000¹³⁸. Earlier there were no specific responsibilities for the event organisers, institutional generators. Introducing responsibility for the waste generator will improve the segregation and

¹³⁵ As per Rule 3(d) of the Plastic Waste Management Rules, 2016 ‘commodity’ means tangible item that may be bought or sold and includes all marketable goods or wares.

¹³⁶ As per Rule 3(x) of the Plastic Waste Management Rules, 2016 ‘waste generator’ means and includes every person or group of persons or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defense establishments which generate plastic waste.

¹³⁷ As per Rule 3(q) of the Plastic Waste Management Rules, 2016 ‘plastic waste’ means any plastic discarded after use or after their intended use is over.

¹³⁸ Rule 8(2) of the Plastic Waste Management Rules, 2016.

reuse/ recycle. It also aims at reducing littering¹³⁹. This will improve plastic waste ‘management’¹⁴⁰.

Rule 11 lays down that each plastic carry bag and multilayered packaging shall mark or labelling on such bag and packaging bearing the name and registration number of the manufacturer in English. If the carry bag is recycled it should be labelled as “recycled” on it and also shall conform to the Indian Standard.

Rule 13 mandates every manufacturer, producers and recyclers of plastic carry bags, multilayered packaging to seek registration with State Pollution Control Board (SPCB). The registration granted under this rule shall initially be valid for a period of one year, unless revoked, suspended or cancelled and shall subsequently be granted for three years¹⁴¹.

6.11 An Overview

From the above analysis it can be said that the problem concerning bio-medical wastes can be properly handled under the general and specific laws as described above. For example, the dumping of the bio-medical wastes such as human tissues, blood stained clothes, bandages, disposable syringes, needles etc. in the open field poses harmful effect to the environment by way of creating nuisances and can be said to be a fit case under both the Indian Penal Code and the Code of Criminal Procedure considering the act or omission as a crime. On the other hand, the specific laws on the subject such as Factories Act, Municipal Solid Wastes Management Rules, Plastic Waste Management Rules etc. have direct connection with such wastes and therefore the management of the bio-medical waste can be effectively handled under these laws as well. Thus, it can be concluded that the Bio-Medical Waste Management Rules, 2016 along with the laws as discussed under this Chapter would help in the proper and effective management of it.

¹³⁹Rule 8(1)(b) of the Plastic Waste Management Rules, 2016.

¹⁴⁰As per Rule 3(y) of the Plastic Waste Management Rules, 2016 ‘management’ means the collection, storage, transportation reduction, re-use, recovery, recycling, composting or disposal of plastic waste in an environmentally safe manner.

¹⁴¹Rule 13(9) of the Plastic Waste Management Rules, 2016.

CHAPTER VII

CURRENT SCENARIO OF THE BIO-MEDICAL WASTE MANAGEMENT IN INDIA UNDER THE EXISTING LEGAL FRAMEWORK: A CRITICAL ANALYSIS OF BIO-MEDICAL WASTE MANAGEMENT RULES, 2016.

7.1 The Existing Scenario of Bio-Medical Waste in India

In India, there are about 6,00,000 hospital beds, over 23,000 Primary Health Centers, thousands of registered nursing homes, countless unregistered nursing homes and dispensaries, and above all a very large number of quacks practicing at every nook and corner of urban and semi-urban locality. The hospitals are tertiary care hospitals usually associated with teaching colleges, district hospitals of more than 2000 and health care dispensaries. There are innumerable pathology laboratories, the data of which is hardly available¹. According to health information statistics, 20% of total beds are in rural hospitals while 80% are in urban hospitals². Extrapolating from past figures of number of beds and average quantity of waste generation at the rate of 1 kg per bed per day, it is estimated by Ministry of Environment and Forest (MoEF) that about 0.33 million tons of hospital waste is being generated per year³. But as per latest report, total bio-medical waste generation in the country is 484 tons per day from 1,68,869 healthcare facilities (HCF). Of this, 447 tons per day is treated.⁴ The figure given below in the Table shows that 4,05,702 kg of Bio-Medical Waste (BMW) is generated in top five States in India with only 2,91,983 are being disposed of everyday. The figure confirms that every day, 1,13,719 kg of waste is left unattended which more often than not re-enters the system⁵.

¹ Kamalakanta Muduli and Akhilesh Barve, "Challenges to Waste Management Practices in Indian Health Care Sector", International Conference on Environment Science and Engineering Vol. 32 IPCBEE pg. 63 (2012).

² A.D.P.Biharatil and A.V. Shekdar "Health-Care Waste Management in India" Vol. 63 Journal of Environmental Management pgs. 211–220 (2001).

³ Kamalakanta Muduli and Akhilesh Barve, "Challenges to Waste Management Practices in Indian Health Care Sector," International Conference on Environment Science and Engineering Vol. 32 IPCBEE pg. 63 (2012).

⁴ "New Rules Notified for Management of Bio-Medical Waste" *The Times of India*, March 27, 2016.

⁵ Amitava Srivastava and Nirmala Ravindran, "Rich Trash Pickings, A flourishing repackaging industry brings disposed medical waste back into the nation's healthcare system" *India Today in*, November 5, 2011.

Table 1**Top Five Bio-Medical Waste Generating States⁶**

States	BMW generated (kg/day)	BMW disposal (kg/day)
Karnataka	62,241	43,971
Uttar Pradesh	44,392	42,237
Maharashtra	40,197	40,197
Kerala	32,884	29,438
West Bengal	23,571	12,472
Total	4,05,702	2,91,983

The above data shows that how the countries healthcare waste problem has become a growing menace along with the municipal wastes turning the country into a dumping ground as it can be seen that everyday each part of the country is covered up with filth litters and waste garbage. What is most shocking is that despite the existence of the various laws on the subject and the adoption of different policies and guidelines by the government the situation remained unchanged and still there is a continuing tendency of not following of the laws as can be seen from the Table 2 below which is highly alarming. The government is also persistent in introducing new projects and the recent step being the launching of three mega urban schemes in India, i.e., Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and Housing for all in urban areas, is an attempt to set in motion the process of urban transformation to enable better living. The missions are new, innovative and focused on pressing needs to improve the quality of life for citizens today, and in the future. Such steps is the outcome of countries Prime Minister Mr. Narendra Modi's vision to recast India's urban landscape includes among others sanitation including solid waste management, sustainable development and health and education.⁷ In addition to it, the Prime Minister's dream vision towards a *Swachh Bharat* is with a view to complete eradication of the wastes to make a clean country habitable for all.

⁶ S Manasi, K S Umamani, *et. al.*, "Biomedical Waste Management: Issues and Concerns - A Ward Level Study of Bangalore City" The Institute for Social and Economic Change, Bangalore pg. 5 (2014).

⁷ Second Smart Cities India 2016 Expo held on 11, 12 and 13 May in Pragati Maidan, New Delhi highlighted the above core infrastructure elements.

Table 2**States with Highest Number of Violators⁸**

States	Number of facilities violating BMW Rules
Maharashtra	4,667
Kerala	1,547
Bihar	1,221
West Bengal	632
Uttar Pradesh	532
Tamil Nadu	507
All India	13,037

From the table referred above it is clear that the most populated States of the country having growing number of health care facilities are the producer of the BMW and they at the same time are the violators of the existing laws. It is estimated that Indian health care industry is growing at a rate of 12% per annum⁹, which necessarily implies that the generation of such a huge quantity of BMW, if not properly controlled and managed would have a devastating effect having far reaching consequences not only to the environment but to the living and other beings that are part of it. In view of the above table, it is important to have a detail analysis of the existing State-wise scenario prevailing in the health care institutions and the steps already undertaken or to be undertaken by such institutions in the light of the existing laws. The selection of the State has been made in view of the top five generator of the Bio-Medical Waste in the country alongwith other States in order to get a clear picture about the existing scenario prevailing in the country.

7.1.1 Maharashtra

A detail analysis of the data on bio-medical waste during 2005-2010 shows that there was a significant increase in the number of health care facilities in

⁸ *Ibid.*

⁹ Richa Prasad and Dr. Parul Sharma, *Bio-Medical Waste Management: An Emerging Issue*, cited in Dr. Ramesh Kumar Miryala and Dr. Ravi Aluvala (Eds.), *Trends, Challenges and Innovations in Management* pg. 104 (Zenon Academic Publishing, Hyderabad, 1st Edn., 2015).

Maharashtra from 2008-2009. The total volume of such waste generated in 2006 was higher than any other year¹⁰. Total bio-medical generated in the State is close to 43,380 kg/day¹¹. This estimate includes wastes generated from both bedded and non bedded health care institutions. Region wise, as expected Mumbai contributes approximately 23.26% of the total BMW load. Pune contributes approximately 19.58% and Nagpur is close third with 17.33% contribution¹².

There are thirty one common bio-medical waste treatment and disposal facilities operators and transporters operating for the proper treatment and disposal of the bio-medical waste in Maharashtra. All the operators have taken responsibility for transportation of such waste. Maximum number of operators and transporters are in Pune region. Some of the operators and transporters cover health care facilities in more than one region¹³.

The Mumbai Medical Waste Action Group and the All India Institute of Local Self Governance have studied the quantum of waste in Mumbai. According to its report¹⁴ based on a questionnaire, the waste generation figure is given as in the table below:

Table 3

Waste Generation in Mumbai's Hospitals

Hospital	Total waste per patient per day (kg)
Private (upto 20 beds)	0.25
Private (21-50 beds)	0.19
Private (above 50 beds)	0.98
Municipal	1.08
Government	0.7

¹⁰ Government of Maharashtra, "Status of Biomedical Waste Management in the State of Maharashtra, 2010" Maharashtra Pollution Control Board, Environment Management Centre pg. 10 (June, 2011). ,

¹¹ *Ibid* at pg. 19.

¹² *Ibid* at pg. 20.

¹³ *Ibid* at pg. 28.

¹⁴ Dr. Sushma Sahai, *Bio-Medical Waste Management* pg. 281 (A.P.H. Publishing Corporation, 1st Edn., 2009).

Out of the total waste generated in the health care institutions in the State whether owned privately or by the government, the following table gave a clear picture of different category of waste generated per bed per day in such institutions.

Table 4

Category-Wise Waste Generated/Bed/Day¹⁵

Waste Type	Kg/Bed/Day
Total Infectious	0.30
Non Infectious	0.41
Recyclable	0.05
Total Waste	0.76

The current waste management system is a two-bag system: yellow for infectious waste and black for non-infectious waste. Special jerry cans have been made for sharps that can be autoclaved. Tata Memorial Hospital, a cancer hospital in Mumbai has recently invested in alternative technology, in the form of hydroclave. The cytotoxic drugs and body parts are sent to the crematorium for burning while the rest are segregated and recycled¹⁶.

The Indian Express, dated August 22, 2013, reported that the Auditor General (AG) of Maharashtra had found the Maharashtra Pollution Control Board (MPCB) deficient in disposing the BMW generated at pet clinics in Pune region-Pimpri Chinchwad and Solapur. In Satara sub-region, none of the 162 institutions have obtained membership of the common BMW treatment facility and 87 of them have not even furnished the required undertaking. This issue poses a serious threat to the surrounding environment and people living there, the audit observed¹⁷.

State legislature's Public Accounts Committee (PAC) has also showed concern regarding the unscientific disposal of BMW unbridled in Mumbai and how it could pose serious threats to citizen's health. The PAC also sounded an alarm over

¹⁵ The Bombay community Public Trusts, "Bio-Medical Waste Management: Understanding our Civic Issues," Available at: <http://www.bcpt.org.in/articles/biomedical.pdf> (Last visited on Sept. 15, 2016).

¹⁶ *Ibid.*

¹⁷ Partha Sarathi Biswas, "Audit: MPCB has failed to address veterinary bio-medical waste issue" *The Indian Express*, August 22, 2013.

rising urban pollution levels. The other worrying points it raised was that several hospitals and clinics in the city do not segregate the waste as also how the callous way of dumping waste has indeed caused a spurt in diseases such as malaria and even cancer. “Citizens in the big cities like Mumbai and Pune are exposed to the rising hazard of the epidemics and critical illnesses due to rising pollution and bad environmental conditions. The rise in critical illnesses like cancer is worrisome,” the report stated¹⁸.

7.1.2 Kerala

The number of health care facilities in the State is highest among all the States. With the increasing in number the complexities are also increasing in nature. The Environment Department (ED) is the administrative department at Government level for matters relating to environment. Kerala State Pollution Control Board (KSPCB) is the Prescribed Authority in the State to enforce the provisions of the Rules. The KSPCB has its head office at Thiruvananthapuram. There are three regional offices and fourteen district offices in the State. According to a report by Central Pollution Control Board (CPCB), Kerala has the highest number (about 27%) of health care institutions in India. The total bed strength of hospitals in Kerala is 1,13,530 of which 43,273 are in the Government sector, 2,740 in the cooperative sector and 67,517 in the private sector. The Board has so far identified nearly 4000 bio-medical waste generators in the State¹⁹. According to a research report²⁰ conducted over a period of one year during 2012-2014 with the aid of University Grant Commission (UGC) interviewing 200 health care workers and 100 residents living nearby, many of the hospitals in Kerala neither have a satisfactory waste disposal system nor a waste management and disposal policy. On an average the volume of total medical waste in hospitals in Kerala is estimated to range between 1 kg and 2 kg

¹⁸ *Hindustan Times*, August 10, 2013.

¹⁹ Report of the Common Bio-Medical Waste Treatment Waste Treatment Facility, Malabar Enviro Vision Pvt. Ltd., Kerala “Pre-feasibility Project Report of centralized Bio-Medical Waste Treatment Facility in Kerala,” *Available at*: http://www.nswai.com/nswaiadmin/Pdfs/insertPdf/i_2015/i_Dec15/Pre-feasibility%20Report%20Centralized%20Biomedical%20Waste%20Treatment%20Facility%20in%20Kerala.pdf (Last visited on Sept. 19, 2016).

²⁰ T.I. Andrews, “The Problem and Challenges of Medical Waste Management Study with Special Reference to Kerala State”, *Available at*: <http://www.catholiccollege.com/v1/projectCms3121.html?pid=11&mode=projectAction> (Last visited on Sept. 20, 2016).

per day on a per bed basis and most of the hospitals and clinics dispose of in the available open ground with no regard to hygiene considerations. Test check of the records maintained for the bio-medical waste in the forty health care facilities in the selected districts revealed that the segregation of waste as stipulated was not carried out in eighteen institutions till date. In three Medical Colleges and one General Hospital with bed strength ranging between 747 and 1,600 and generating substantial quantities of waste, segregation was started between February 2004 and November 2005 only against the prescribed date of June 2000²¹. In the absence of State level inventory of health care institutions and non-possession of authorisation by 83 per cent of the identified health care facilities, the Prescribed Authority/State Government has no mechanism to monitor the proper segregation of waste generated²².

It is surprising that bio-medical waste is not fully segregated at source in a State where there is 100% literacy. This, in turn, increases the risk factor of entire solid waste generated from health care facilities because the infectious bio-medical wastes when gets mixed with non-infectious waste turned the whole waste as infectious.

Regarding the treatment and disposal of the waste, though lately, the Government of Kerala has prepared a vision document²³ on biomedical waste management. This document is the first of its kind in India. As per the vision document, Government is proposing to install three Common Bio-Medical Waste Treatment Facility (CBMWTF) in the State. Already there is one common biomedical waste treatment and disposal plant in Kerala working at Palakkad district in the Indian Medical Association (IMA). Apart from this, the IMA is having proposal to start two more common facilities at other parts of the state, which are at different stages of its implementation. Once these common facilities become a reality the environmental problems due to such waste will be improved. Regarding authorisation, audit scrutiny

²¹Government of India, Audit Report of the Environment Department (Civil), "Management and Handling of BMW" pg. 8 (March, 31 2007), Available at: <http://iced.cag.gov.in/wp-content/uploads/2014/02/3.-PA-on-Bio-Medical-WM-in-Kerala.pdf> (Last visited on Sept. 25, 2016).

²² *Ibid.*

²³ Ministry of Environment, Forests & Climate Change, Govt. of India Sponsored, "Environment Information System, ENVIS, Kerala State Council for Science, Technology and Environment", Available at: http://www.kerenviis.nic.in/Database/Soil_836.aspx (Last visited on Sept. 26, 2016).

conducted in 2007²⁴ revealed that majority of the identified 5,200 health care institutions had not applied for authorisation. As a result 83 per cent of the identified institutions were functioning without authorisation in gross violation of the Rules.

7.1.3 Bihar

The prevalent bio-medical waste management practices in the State of Bihar are highly deficient. Storage of wastes at source is generally not attended to. The bio-medical waste has been grossly neglected in the State. Large number of hospitals, nursing homes, health care centers has been identified by the Bihar State Pollution Control Board (BSPCB) but do not take any measure for the safe disposal of the waste. As a result, the wastes get mixed up with the municipal solid waste and deposited at the common disposal site. Scrutiny conducted in July, 2014 by Comptroller and Auditor General (CAG)²⁵ revealed BSPCB neither prepared any comprehensive plan nor conducted any survey to identify the health care institutions to prevent, control and abate pollution. During scrutiny, it was observed that there was 2538 numbers of health care institutions identified in the State. Out of this, 1329 had applied for authorisation and granted authorisation to 1239 up to December 2013²⁶. Thus, 1209 has failed to apply for authorisation which is an impediment in the management of the waste in the State. Further, out of 1329 health care institutions applied for authorisation, 90 have failed to receive any authorisation from the authority.

Regarding the treatment of waste scrutiny, the records revealed that effluent treatment plants were installed in only six out of 1239 authorised institutions. The existing position with regard to CBMWTF is also very poor. The CBMWTF operator at Patna covered 539 health care institutions having 11243 beds against norms of 10000 beds. The operator at Bhagalpur and Muzaffarpur reported that total 77 health care institutions are not sending the waste for treatment²⁷.

²⁴ Government of India, Audit Report of the Environment Department (Civil), "Management and Handling of BMW" pg. 85 (March, 31 2007).

²⁵ Government of Bihar, Performance Audit on the Working of the Bihar State Pollution Control Board, Environment and Forest Department pg. 10 (2014).

²⁶ *Ibid* at pg. 20.

²⁷ *Ibid* at pg. 22.

Further, according to guidelines issued by the CPCB (October 2013), the CBMWTFs operating bio-medical waste incinerator were required to get analysis report of the hazardous constituents of the incinerator ash generated through a recognised laboratory. This provision was being violated by three CBMWTFs in the State. The scenario of the capital city of Bihar is also the same. There are 31 public and private hospitals and more than 100 nursing homes in the city, according to Patna Municipal Corporation's Executive Engineer²⁸. It is estimated that 3.6 tonnes of biomedical wastes is generated in the city per day²⁹. The total quantity of waste generation estimated may go up further as there are large number of health clinics and similar health care institutions which do not have inpatient facilities and various types of clinical laboratories, dental clinics, etc. These health care institutions are not accounted for in this estimation of waste generation.

All types of wastes are mixed together and disposed of. Most of the health care institutions in the city are not having adequate facilities for the safe disposal of the biomedical waste. Wastes are either dumped in open space behind the hospital and occasionally burnt causing severe air pollution and land pollution. In certain hospitals, incinerators are provided, but the same is not meeting the statutory requirements of operation and emission standards and are a source of pollution. Presently, twelve captive incinerators/autoclaves are available in Patna, with variable efficiencies. It is observed that in reality, many of them are not in functional state³⁰. The contaminated syringes and needles are dumped along with other wastes, which are being collected by scavengers and illegally returned to the hospitals. The body parts often dumped along with the wastes has been seen carried by birds and animals. The hospital authorities and staff are not fully aware of the seriousness of the problem created by the unscientific way of disposal of these wastes and hence give only very little attention to the disposal of these wastes.

²⁸ S.K.Mandal, and J. Dutta "Integrated Bio-Medical Waste Management Plan for Patna City" Institute of Town Planners, India Journal pg. 9 (April - June 2009).

²⁹ *Ibid* at pg. 11.

³⁰ Final Environmental Impact Assessment, "Proposed Common Bio-Medical Waste Management and Recycling facility, Patna, Bihar" Ramky Enviro Engineers Limited, Hyderabad pg. 1.4 (May 2015).

7.1.4 West Bengal

The West Bengal Pollution Control Board (WBPCB) under the Environment Department (ED) is the Prescribed Authority for enforcement of bio-medical waste Rules in the State of West Bengal and the Health and Family Welfare Department (H&FWD) is responsible to provide funds and other infrastructural support to the occupiers under it to implement the Rules. The Deputy Director of Health Services and the Chief Medical Officers of Health (CMOH) were the licensing authorities for private health care units (HCU) in Kolkata and other districts respectively. Audit had test checked the records of ED, WBPCB and its four Regional/Sub Regional offices, H&FWD, one Common Bio-Medical Waste Treatment Facility operated by a private agency, for District Magistrates offices, eight Municipal Corporation/Municipalities, four CMOHs, twenty Government Colleges and Hospitals/District Hospitals/Subdivision Hospitals/General Hospitals/Rural Hospitals in seven sampled Districts. The following table will help in understanding the existing scenario of the generation, treatment and disposal of the BMW as per the findings of such Audit³¹.

Table 5

The quantities of untreated BMW generated, treated and disposed of in the State during 2002-2008³² were as follows:

Year	BMW generated (tonnes)	BMW treated (tonnes)	BMW disposed of untreated (tonnes)	Percentage of untreated waste
2002-03	8595.39	487.52	8107.87	94
2003-04	7767.62	3239.38	4528.24	58
2004-05	8490.26	3309.82	5180.44	61
2005-06	8729.34	3899.29	4830.05	55
2006-07	8647.03	4147.13	4499.90	52
2007-08	8972.70	4936.00	4036.70	45

³¹ Government of West Bengal, Audit Report (Civil), Environment and Health & Welfare Department, Government of West Bengal, 2008, pg. 93 (March 31, 2008).

³² *Ibid.*

The figure shown above, although, is an estimate, however, it shows a healthy improvement in the reduction of untreated waste from 2002-03 to 2007-08 and if steps are taken for the strict compliance of the existing Rules considering its serious effect on the environment the situation will be changed in near future.

Regarding segregation, WBPCB had advised use of four colour coded bags i.e. red, yellow and blue for infectious, anatomical, sharps/needles/syringes respectively and black bags for Municipal Solid Waste (MSW). Bio-medical wastes were required to be segregated at the points of generation by using the said colour coded plastic bags/containers with 'bio-hazard' or 'toxic hazard' symbol. According to the report, inspection done by WBPCB disclosed that segregation at various government or private health care facilities was not done properly and the Central Pollution Control Board also reported mixing of bio-medical waste with MSW after random inspection of 17 private health care institutions in Kolkata³³.

The scenario regarding transportation and disposal of the waste is also very poor. The report shows that the municipal authorities used to carry both treated and non-treated and sometimes even non-segregated bio-medical waste for disposal in dump site without considering the health hazards in violation of the Rules. H&FWD procured 16 waste treatment facilities for management of such wastes between September 2001 and March 2004 at a cost of Rs 3.76 crore under the West Bengal State Health System Development Project II (WBSHSDPII), a World Bank aided project. Out of eleven waste treatment facilities, five remained inoperative since installation due to absence/non cooperation of operator and non availability of consumables and two remained functional for only two to five months up to December 2006 due to theft/ damage of parts³⁴.

In six districts of North Bengal, against 258 HCUs (8799 beds) under H&FWD there were only two autoclaves in working condition out of four installed. Thus, due to lackadaisical attitude of the department in operationalising the waste treatments facilities, the autoclaves though installed could not be used³⁵.

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ *Ibid* at pg. 94.

North Bengal Medical College and Hospital with 589 beds, the only referral Government HCU in North Bengal (situated within Gram Panchayat near Siliguri town) had no facilities for the treatment of such wastes, not even a vat for storing of the same. The wastes are found dumped in different places inside the hospital premises and even within the vacant courtyard between wards and by the side of the walk away corridor (See the picture below) and burnt under the open sky. Thus, due to lack of infrastructure, awareness and initiatives on the part of the local authorities as well as the Department the situation is becoming worse.

Figure 1:

Picture shown the present scenario of the Bio-Medical Waste in North Bengal Medical College & Hospital published in the Bengali Daily Anandabazar Patrika³⁶



³⁶ The daily Anandabazar Patrika, May 26, Thursday, 2016.

Figure 2:

The North Bengal Medical College & Hospital is grinded by Bio-Medical Waste³⁷



7.1.5 Tamil Nadu

The State of Tamil Nadu has been one of the few States in India to take active interest and initiative in addressing bio-medical waste management since early 2000. Through various government and non-government initiatives the Tamil Nadu Pollution Control Board (TNPCB) has been proactive in raising awareness and facilitating the setting up of CBMWTF across the State. Through partnership with Indian Medical Association (IMA) and Tamil Nadu Health Systems Project (TNHSP)

³⁷*Ibid.* The news has been translated in English-The Bio-Medical Waste has been seen litters everywhere within the NBMC&H adjacent to the wards. The bad odour from the trashes is badly affecting the patients and the visitors who are using the corridor. This gives rises the question from all corner for the proper management of the waste. The patients and their relatives have alleged that the BMW and other wastes are being disposed of around the hospital whether it is the Medicine Ward, Emergency Ward or Labour Ward which resulted in the pollution to the surroundings. They also alleges that the patients whose bed is near the widow, they are the most sufferer. According to the correspondent, Rupees five lakhs had sanctioned five months back in the meeting of the Rogi Kalyan Samity, till date no work has been done to remove the same. On interviewing Dr. Nirmal Bera, Superintendent of the NBMC&H has said that there was some mistake in recording the name of the organisation with whom a contract had entered into. He further said that to remove the difficulties steps has been taken and very soon the problem will be sorted out. He failed to give any assurance as to when the work will begin after removing all difficulties.

the State has actively undertaken training and implementation activities in both private sector and government sector hospitals³⁸. In 2008 waste awareness program had started through a “project for upgrading safety in health care” (PUSH). This programme is monitored by the Tamil Nadu Health System Project (TNHSP) in collaboration with National rural health mission, TNSPCB and Tamil Nadu AIDS prevention and control society³⁹.

A large government hospital typically generates 10,015 kg of bio-medical wastes per month out of which 6,000 kg of needles and dressing material, 4,000 kg of ampoules, vials and other sharp implements and 15 kg of anatomical waste including placenta and amputated body parts⁴⁰. According to Government statistics⁴¹, in Tamil Nadu the majority of beds are in six corporation areas and they are as follows:

Table 6

Bed capacity in six corporation in Tamil Nadu

Corporation	No. of Beds
Chennai	19,600
Coimbatore	6,500
Madurai	2,600
Salem	3,875
Trichy	2,800
Tirunelveli	2,000

Regarding segregation, which is the most important steps towards handling the BMW, study shows that the segregation is made as per the colour coding issued by the government of India and transported to the storage room available in the health care centers⁴². The nursing supervisors are fixed with the responsibility to supervise

³⁸Government of Tamil Nadu, Final Technical Report, Global Health Care Waste Project, R. Rangarajan , “Indian Component of Global Project : Demonstrating and promoting Best Techniques and Practices for Reducing Health-Care Waste to avoid Environmental Releases of Dioxins and Mercury”,Tamil Nadu Pollution Control Board, pg. 22 (2013).

³⁹ *Ibid.*

⁴⁰ *Ibid* at pg. 23.

⁴¹ *Ibid.*

⁴² Deepali Deo, S. B. Tak, *et. al.*, “A Study of Knowledge Regarding Biomedical Waste Management among Employees of a Teaching Hospital in Rural Area” Journal of ISHWM, pg. 5 (April 2006).

biomedical waste registers regarding segregation maintained by the staff nurses available in all the work stations namely wards, outpatient services, casualty, labour room and operation theatres on day to day basis. The colour coding charts are provided in the regional language and pasted near the colour coded baskets in all work stations for immediate reference. With private public partnership the CBMWTF is taken care of by the private operators. Consent for operating CBMWTF facility was given by the government of Tamil Nadu to eight operators located at Chengalpattu, Sriperumpudur, Vellore, Salem, Tanjavur, Arupukottai, Tirunelveli and Coimbatore covering thirty districts of Tamil Nadu. It is the responsibility of these agencies to take away the biomedical wastes from the storage room of health care centers till safe disposal in the common treatment facility.

To monitor effective implementation of biomedical waste management, State level, district level and hospital level monitoring committees have been formulated. In the state and district level committees, NGO, IMA is included apart from government officials from TNPCB and municipal department. The outcome is that the Biomedical waste generated in Tamil Nadu for the year 2009-10 is 531896 kilograms, in 2010-11 it was 429395 Kilograms whereas in 2011-12 it was 282485 kilograms for the total bed strength of 55014. There was also a reduction of expenditure to CBMWTF operators from 2009 to 2011.

7.1.6 Delhi

In Delhi, there are 72 hospitals under government sector, 604 registered nursing homes and 936 dispensaries. In addition to this there are about 1550 unregistered establishments with different names like Nursing Homes, Medical centres, Dental Hospitals, MTP centres etc. About 40000 hospital beds are available in the public and private sector in Delhi.⁴³ Delhi is generating approximately 6500 metric tons of waste out of which 65 tons are expected to be Biomedical Waste⁴⁴. The Government hospitals and major private hospitals have their own arrangement for treatment of biomedical waste. Biomedical waste generated in 30 Delhi govt.

⁴³ Government of NCT of Delhi, "Bio-Medical Waste: Status in National Capital Territory of Delhi, Directorate of Health Services pg. 1 (2006).

⁴⁴ According to official figures 70 tons of BMW is generated in the city every day. Unofficial sources put it even higher at about 100 tons daily, *Main online India*, (July 25, 2013).

hospitals vary from 780 grams/bed/day (Shushruta Trauma Centre) to 30 gram /bed/day (Guru Nanak Eye Centre) with an average of 260 gram /bed /day. Similarly Bio-medical waste generated in 31 hospitals other than Delhi government vary from 580 grams/bed/day (Infectious Disease Hospital) to 30 gram /bed/day (Venu Eye Institute and Research Centre) with an average of 200 gram /bed /day⁴⁵. An examination of the records covering the period 2010-11 to 2012-13 of eight government hospitals (four in Delhi and four outside Delhi) under the administrative control of the Ministry of Health & Family Welfare, was undertaken to assess the compliance of the Rules by these hospitals with respect to generation, collection, treatment, handling and disposal of bio-medical wastes. The findings are as follows:

In Lady Hardinge Medical College and its associated hospitals, intermittent shortage of coloured bags was noticed. Delhi Pollution Control Committee (DPCC) stated that no intimation regarding shortage of bags for disposal of waste was given by the hospitals to the DPCC officials during inspections. In the absence of proper garbage bags possibility of improper segregation and disposal of BMW in this hospital could not be ruled out⁴⁶.

Regarding storage and transportation the existing Rule stipulates that untreated bio-medical waste shall not be kept stored beyond a period of 48 hours provided that if for any reason it becomes necessary to store the waste beyond such period, the occupier must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment. In Shri Vinoba Bhave Civil Hospital, according to the report such waste was stored for more than 48 hours on many occasions during 2010 to 2013⁴⁷.

The treatment and disposal of the bio-medical waste as per the Rule is in compliance with the standards prescribed in Schedule I and V. This standard further stipulates that liquid waste generated from the hospitals shall conform to specified parameters and permissible limits and shall be disinfected by chemical treatment before being discharged into drains.

⁴⁵ *Ibid* at pg. 6.

⁴⁶ Government of India, Report on Management of Bio-Medical Waste in Government Hospitals, Ministry of Health and Family Welfare, (2014).

⁴⁷ *Ibid* at pg.51.

In May 2008, DPCC decided that hospitals having 50 beds or more shall install Effluent Treatment Plant/ Sewage Treatment Plant to treat the effluent generated from the hospital. All the four hospitals located in Delhi, covered in audit, however, showed that three hospitals had not installed the Plant and in one hospital the installed Sewage Treatment Plant was non-functional. Thus the situation in at least two hospitals was highly unsatisfactory and carried high risk to the environment.

At present as per records in Delhi 18 incinerators, 18 autoclaves and 3 microwaves are in operation. Besides this, a Government facilitated operator (Synergy Waste Management Private Limited) has established facility at Okhla that has become operational in November 2006⁴⁸.

7.1.7 Karnataka

Rapid growth in population has resulted in the establishment of large number of Hospitals and Nursing Homes in all places. These health care institutions are undoubtedly necessary for keeping up the well-being of our community, but there waste which is the neglected part needs to be handled carefully. Karnataka has identified 26,927 health care institutions as on March 2014⁴⁹ out of which bedded units are 5170 and non-bedded units are 21757. Approximately 62 tons of health care waste generates from such health care institutions per day. In order to treat such waste 27 CBMWTF had established and out of which 19 are operational. Most of the health care systems follow indiscriminate disposal, which leads to adverse effect both on life and environment⁵⁰.

The scenario of other States of the country is no different. Looking into the above perspective and showing highly concerned, the Environment Ministry has issued show cause notices to 3,585 defaulting health care institutions and common bio-medical waste treatment facilities (CBMWTFs) across the country. Maharashtra state topped the list with 640 show cause notices, Rajasthan, is in second place with health care facilities, while in Uttar Pradesh, Delhi and Karnataka respectively 382,

⁴⁸ Government of NCT of Delhi, "Bio-Medical Waste: Status in National Capital Territory of Delhi" Directorate of Health Services, pg. 7 (2006).

⁴⁹ Status of Bio-Medical Waste Management in Karnataka State, *Available at:* <http://kspcb.kar.nic.in/Status%20of%20BMW%20in%20Karnataka%20state.pdf>

⁵⁰ A.S.Tanksali, "Management of Bio-Medical Waste" International Journal of ChemTech Research, pg. 1214 (April-June 2013).

380 and 374 health care facilities were served show cause notices. As per an order of the Principle Bench of National Green Tribunal (NGT), 33 hospitals in New Delhi were inspected and 17 hospitals were found to be violating the Bio-Medical Waste (Management & Handling) Rules 1998 which the hospitals attributed to financial crunch⁵¹.

Therefore, the need of the hour is to have an overview of the whole system in the control and management of the bio-medical waste to find out the answer of different question that are floating on the air. The most important question among others is what are the reasons that are making hindrances in the path of management of bio-medical waste despite having the effective laws on the subject? Whether the existing laws are insufficient? Or whether there is any need to change the existing laws or the problem can be handled under it? Or why the number of waste generated every day in the country remained un-disposed or disposed of in violation of the existing laws? Looking into the above perspective of failure to manage the waste and to find out the root cause for such lacking behind, the researcher has undertaken under this Chapter to make a review of the present Bio-Medical Waste Management Rules⁵², 2016, earlier Rules on the subject and its various amendments considering the hazardous elements present in such waste. Further, a brief analysis has also made on the National Guidelines on Hospital Waste Management, 2002 and the Five-year plan of the Government to review such problem. The aim of this Chapter is to find out the lacunae of the existing Rules, to highlight on the actual problem in the direction for the proper implementation of the Rules and also to suggest appropriate measures in combating the present situation.

7.2 The National Regulatory Framework for the Management of Bio-Medical Waste

It has already been discussed in the previous chapter that the need of national legislation is the basis for improving the overall conditions of all living in an environment which should be conducive and when such environment gets polluted due to the human activities it adversely affects not only the wholesome environment

⁵¹ “Goa State Pollution Control Board finds Aldona PHC ‘Polluting’”, *The Times of India City*, August 22, 2013.

⁵² Hereinabove termed as the BMW Rules.

but the very existence of all living beings in such an atmosphere becomes impossible. To get rid of the situation and to make the environment habitable there is a need to pass stringent laws the strict compliance of which would help in combating the situation and in turn it would help in the establishment of healthy environment. The deteriorate conditions of the environment, as it believe, is due to the human activities who undertook manifold steps to make faster development and in this journey they made unscientific use of all those which come on the way including the natural resources and this resulted in the imbalance to the ecology which gives rise the concept of pollution. Such is the situation all over the world and India being one of them among others is presently facing an enormous increase of pollution in the environment which made the life of human being and other beings miserable. Such situation that exists in India is not new. A country, when freed from the British rules, it undertook several developmental policies by stepping into the field of industry, adopted various technology to make development faster, uses chemicals to increase productivity etc. forgetting the ill-effect of such technology and chemicals in the environment which turned the atmosphere more worsen to live a healthy life. Similarly, due to industrialisation need was felt towards the urbanisation providing civic amenities to the people and the development of hospital industry is one of such amenities among others which requires special mention here. The consequence of the establishment of various hospital industries on the one hand helped in increasing the health of the people, at the same time it started threatening the environment with the new menace on the other, the hospital borne wastes which is popularly known as bio-medical waste in India. This is inevitable. In fact, development and pollution has been considered as the *sine qua non* to each other. Therefore, the necessity of passing respective law to control, manage and reduce such wastes was felt and the outcome was the passing of the Bio-Medical Wastes (Handling & Management) Rules, 1998.

Prior to 1998 there was no such laws on the subject although the Apex Court showing concern on such wastes, for the first time brought to the day light the duty of the government for the safe disposal of such waste in the year 1996 in *Dr. B. L Wadhera's*⁵³ case. While delivering the judgement in this case the Hon'ble Supreme

⁵³ *Dr. B. L. Wadhera v. Union of India*, AIR 1996 SC 2969.

Court directed the Delhi Municipal Corporation to take appropriate measures to deal with the same. In fact, the Bio-Medical Wastes (Handling & Management) Rules, 1998 has been considered as the outcome of the Apex Court's concern on the subject. Since then and till date various research work have been undertaken on the subject criticising its provisions and the outcome of which is the amendments of the Rules (2000 and 2003) for twice and the framing of draft Rules in the year 2011 to overcome the difficulties. Despite such an attempts, it was found that the Rules still suffered from further lacunaes and there is an urgent need to re-draft and to have a new rule on the subjects to cope up with the existing bio-medical waste related problem and this culminated in the passing of the new Bio-Medical Wastes Management Rules, 2016. With the passing of the new Rules the question remains whether the existing Rules is comprehensive and the problem of the bio-medical waste in the country could be resolve within the ambit of the new Rule or whether some more steps required to be taken to solve such problem within the ambit of the present Rules.

In search of the answer to the above questions, where on the one hand, there is an urgent need to control and manage such waste at the earliest possible without any delay under the existing regulatory framework to reduce the menace arising from such wastes, it is also important to have an overview of the Rules, 2016 on the other, to find out the drawbacks in the existing Rules, which is putting hindrances on the way for the proper and effective management of it. It is important to note here that not all wastes that comes under the term bio-medical waste is harmful. It is the hazardous substances involved in such wastes are highly infectious in nature and are the responsible for various infectious borne diseases and also are the cause of concern which need to be carefully segregated, treated and is to be disposed of properly. Although the quantity of hazardous waste is very meager out of the total generation of bio-medical wastes, it is considered as most harmful due to the infectious elements present in it. Therefore, in the quest to find out an immediate healthy relief to cope up with such menace, an elaborate analysis of the Rules have been made under this chapter concentrating mainly on the hazardous nature of such waste, so that it would be possible to reach to identify the root cause and thereby suggest and recommend certain measures highlighting on the actual problem the country is facing before making concluding remarks. Here, it is pertinent to mention that in the subsequent

chapter an analysis of the provisions of other relevant laws having relations with the bio-medical wastes as a whole have been made to understand whether an action may be properly undertaken under such laws against the generators who comes within its fore violating such provisions. In the same chapter an analytical study has also made of those specific Acts/Rules that are connected with the various types of bio-medical wastes. Bio-medical waste Rules, being the research topic, the researcher thought it fit to make an extensive analysis separately under this chapter which would help in finding the possible solution of the problem along with suggestive measure to mitigate the same.

Before starting with an extensive discussion on the topic it is relevant to focus on the Government's approach towards the effective management of bio-medical wastes in the light of national guideline and the measures adopted under the long term five-year policies. This would help in taking appropriate steps on the part of the generator of the bio-medical waste with a view to curve the menace involve in it.

7.2.1. National Guidelines on Hospital Waste Management, 2002

It was issued by the Ministry of Health & Family Welfare (MoHFW), Government of India in March 2002. These guidelines include safety measures, waste management, training and related administrative functions in hospitals and its environment. As per the Guidelines, the head of the hospital shall form a Waste Management Committee (WMC) under his Chairmanship. The Committee shall meet regularly to review the performance of the waste disposal. The Committee is responsible for making hospital specific action plan for hospital waste management and for its supervision, monitoring implementation and looking after the safety of the bio-medical waste handlers⁵⁴. The important aspects of these guidelines are the aim, definition and categories of Bio-Medical Wastes. The policy statement aims to provide for a system for management of all potentially infectious and hazardous waste in accordance with the Rules.

Besides these, the national guidelines have been clearly laid down as to transportation, treatment of different types of wastes, safety measures and training of

⁵⁴Government of India, "Guidelines for Bio-Medical Waste Disposal", Press Information Bureau, Ministry of Health & Family Welfare, (August 28, 2012).

medical and paramedical personnel. The constitution of the waste management committee with the head of the hospital as its chairman has been strongly advocated. Besides, co-ordination between the hospital agencies has been recommended. Finally the educative and co-operative angle of these guidelines is seen when the NGOs involvement in dissemination of information is solicited while laying down that healthcare units with treatment facilities should extend the same to others in the vicinity.

7.2.2 Infection Management and Environment Plan (IMEP), 2007

In addition to the above, a National Policy Framework document and Operational Guidelines for Community Health Centres, Primary Health Centres and Sub-centres have also been developed by MoHFW in 2007, for implementation of Infection Management and Environment Plan under Reproductive and Child Health Programme to address the issues relating to infection control and waste management. The purpose of the IMEP is to ensure that all parties/stakeholders recognise that the maintenance of sanitary conditions, use of appropriate disinfection and sterilisation techniques, provision of potable water and clean air in the health care facilities and nosocomial infection control are the basic infrastructural requirements for delivery of Reproductive and Child Health (RCH) services.

Through a structured and systematic approach, the IMEP aims to bring in state-of-the-art, best practices in managing these health and environmental risks effectively. It comprises two volumes –

Policy Framework: A summary version that gives a broad overview and generic guidance to central and state level institutions on the establishment of a system for sound infection control and bio-medical waste management.

Operational Guidelines: Designed as an instruction manual for healthcare workers at PHC, CHCs and SCs and provides details of the procedures, plans and guidelines of infection control and waste management procedures.

While the Policy Framework is targeted to senior management, the Operational Guidelines are mainly for doctors, nurses and various levels of healthcare

workers. Hence, the range of the IMEP covers the entire chain of stakeholders in the healthcare system.

For infection control, it has come up with various steps to be followed while handling infectious bio-medical waste by insisting on the hand washing among others. Apart from hand washing, it also insisted on the personal protective equipments which include personal protective gears while handling waste, wearing head gears, eye covers (glasses), mask, apron, gloves and boots. These constitute the barrier for transmission of infections. Taking immunisation against Hepatitis B and Tetanus are the important universal precautions suggested by the IMEP. The plan also emphasises on the use of disinfectants such as bleaching powder and the procedure to follow in this regard⁵⁵.

7.2.3 Guidelines of the Central Pollution Control Board (CPCB)⁵⁶

CPCB has brought out Guidelines that are relevant for the health sector as given below. Under the National Rural Health Mission these guidelines should be used wherever applicable.

7.2.3.1 CPCB Manual on Hospital Waste Management, 2000

CPCB brought out this technical guidance in the areas of bio-medical waste segregation, storage, transport and treatment. The CPCB manual gave special emphasis to incineration, covering incinerator emissions, maintenance requirements, operational problems & solutions, and pollution control systems.

7.2.3.2 Guidelines for Universal Immunisation Programme

Universal Immunisation Programme (UIP) in India is one of the largest health programmes in the world for giving vaccinations to children and women. The vaccination practice of the UIP so far involved the use of either glass or disposable syringes. Such waste generated in rural areas, particularly at outreach points, is a matter of concern. CPCB has prepared guidelines for disposal of biomedical wastes

⁵⁵Government of India, “Infection Management and Environment Plan” Guidelines for Healthcare Workers for Waste Management and Infection Control in Community Health Centres, Ministry of Health & Family Welfare, pg. 7 (March, 2007).

⁵⁶ *Ibid.*

that will be generated. The salient features of these Guidelines are captured in the Operational Framework included in this document.

7.2.3.3 Guidelines on Auto Disable (AD) Syringes

Studies on injection safety has revealed that a significant number of injections are used in immunisation are unsafe. The Government of India decided to introduce Auto Disable (AD) syringes instead of glass or disposable syringes to minimise the risk of infections through reuse of inadequately sterilised and/or infected syringes. However the use of AD syringes will generate relatively large quantities of plastic bio-medical waste, which need to be disposed in an environmentally sound manner. This guidance is provided by CPCB in its Guidelines on AD syringes. This is similar (not contrasting) in content with the Guidelines on Universal Immunisation Programme.

7.2.3.4 Guidelines on Mercury-Contaminated Wastes

CPCB has recognized that there is a possibility of waste containing mercury and its compounds to be above the permissible limit in terms of the concentration, and hence has to be regarded as hazardous. In November 2005, CPCB has written to all State Pollution Control Boards to make the segregation of mercury-contaminated waste materials a condition for granting authorisation to the healthcare facilities. CPCB also notes that new healthcare establishments will have to ensure the mercury-laden waste is properly segregated, treated and disposed

7.2.3.5 CPCB Guidelines for Bio-Medical Waste Incinerators

CPCB Guidelines for bio-medical waste incinerators include requirements for the incinerator design and its air pollution control device, physical structures (incineration and waste storage rooms), operator qualifications, personal protection equipment, and emergency procedures.

7.2.4 National Health Mission⁵⁷

Under the National Health Mission (NHM), financial assistance is provided to State/Union Territory Governments within their resource envelope for Bio-medical

⁵⁷ Government of India, “Disposal and Recycling of Bio-medical Waste” Press Information Bureau , Ministry of Health and Family Welfare, (March 3, 2015).

waste management and infection control activities in public health facilities based on their proposals in Programme Implementation Plan (PIP) of NHM. This includes support for Civil Works for Operationalising Infection Management & Environment Plan at health facilities, Human Resource for Biomedical waste management activities such as Incinerator Operators, procurement of equipment such as trolleys, autoclaves, incinerators, colour coded bins, and buckets etc., IMEP training of medical officers, district and state programme managers, health staffs etc., in Biomedical Waste Management Practices, IMEP protocols and activities.

7.2.5 Infection Control and Waste Management under National AIDS Control Project (NACP) III⁵⁸

The Programme Implementation Plan of NACP III has provided a detailed plan on infection control and waste management and recommended that good practices may be further tailored to suit the facility's needs. The Plan has been developed on the following framework:

1. **Waste Segregation and On-site Storage:** This Component includes segregation at source, availability of designated segregation points as close as possible to the generation points, good quality and adequately sized containers, use of non-chlorinated plastic bags, needle cutters and safety boxes, strict adherence to colour-coding provided in the Bio Medical Rules and compliance to the above to be ensured by programme implementers of NACP III.
2. **Collection and Transportation of Biomedical Wastes:** This section encompasses transport of waste to a central location, specially designated waste routes to avoid patient care areas within the facility, Special timing for transportation of biomedical waste to the central point, use of dedicated wheeled-containers, trolleys or carts to transport the waste to the collection/treatment site and training and provision of barriers for waste handlers.
3. **Treatment and Disposal of Biomedical Wastes:** It delineates, disinfection of used blood bags, syringes and other infectious plastic and liquid wastes in accordance with the existing Bio-medical Waste Rules, proper handling and

⁵⁸ Government of India, Infection Control and Waste Management Plan for National AIDS Control Support Project (NACSP)" National AIDS Control Organisation, Ministry of Health & Family Welfare, pg.36 (2012-17), (December, 2012).

disinfection of infected linen and maintenance of a log book for quantity of waste generated by type, name of waste handler, time of emptying waste container, time of cleaning the containers and pouring disinfectant.

4. Sharps Management: This section prescribes use of barrier protection; segregation and storage in puncture-proof containers at the point of generation; mutilation of sharps before treatment and disposal; disinfection and appropriate disposal of mutilated sharps; final disposal in a secured landfill or sharp pits and mandatory immunisation against Hepatitis B for all the health care workers.
5. Infection Control: The four key areas of infection control recommended are immunisation against, nosocomial infections, availability and use of barrier protection, timely management of PEP, and creating awareness about infection control at all levels.

7.2.6 National Long-term Policy on Bio-medical Waste under the Five-Year Plans

It was for the first time under the 9th Five Year Plan 1997-2002⁵⁹ the concern for the bio-medical waste had seriously undertaken considering it a part of long-term policy matter for managing it. This was due to the reason that the framing of the Rule on the subject had only thought for and given effect to during these period. After the preparation of the draft Rule and getting final assent in the year 1997 finally it was notified in the month of July 1998. The plan made it mandatory that every hospital located in and around Delhi must have their own disposal system and shall not dump into Municipal bins. The effect of such plan made it possible to follow the direction and implement the same throughout the country.

Under 10th Five Year Plan⁶⁰ it was suggested for the strict rules for proper collection, storage, transportation, treatment and disposal of bio-medical waste and in order to give effect of such rules, the hospitals are supposed to install treatment facilities like incinerators, autoclaves etc. and the plan required that these treatment facilities should operate at designed efficiency level. The use of autoclaves and check

⁵⁹ Government of India, Planning Commission, Ninth Five Year Plan, 1997-2002.

⁶⁰ Government of India, The Bio-Medical Waste, Tenth Five Year Plan, 2002-07, Forest and Environment.

by efficiency test of autoclaves by spore testing methodology was made compulsory to be followed by the health care authority as part of the hospital waste management system.

In the meeting of the Steering Committee held during the 11th five year plan⁶¹ for the management of bio-medical wastes it was decided that the Guidelines for Management and Handling of Bio-medical Wastes shall be finalised after incorporating the comments of the members of the Steering Committee. It was also suggested certain amendments to the Bio-medical Rules required to be made in order to avoid confusion created by the existing Rules. Along with this, the Plan also envisaged a clear commitment to pursue a development agenda which is environmentally sustainable, based on a strategy that translates the vision of environmental sustainability which require that environmental concerns are given a high priority in development planning at all levels.

The 11th five year plan has also proposed for the implementations of “action plans” formulated by Ministry of Health and Family Welfare to take infrastructural development of bio-medical waste. The Central Pollution Control Board (CPCB) suggested for an Environmental Monitoring and Governance because CPCB serves as a technical wing of the Ministry and coordinates with the State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) for implementation of plans and programmes relating to abatement of pollution. The Board had also suggested for the proper and effective implementation of various Rules including the bio-medical waste rule.

In order to monitor hazardous substance management under the 11th Plan, a roadmap has been evolved for proper management of wastes in the country, including issues such as Municipal solid waste, plastic waste, e-waste, Bio-Medical wastes etc. It was suggested for a co-ordinated programme for analysis of trends, for monitoring and work on strategies and support for development of suitable technologies and implementation thereof in an effective manner. Assistance for projects for treatment and disposal of hazardous and biomedical waste was also a part under this plan. The Plan also encourages to have more Common Bio-Medical Waste Treatment Facilities

⁶¹ 2007-2012.

(CBMWTF) from 126 CBMWTF, including 13 under installation, in the country as on March, 2005⁶².

In the 11th five year plan it was also recommended⁶³ that some measures are required to be adopted for the minimisation of waste which also includes hazardous and bio-medical waste among others. They are:

Hazardous Waste:

1. To strengthen the SPCB's, facilitating them in development of technical skills.
2. To identify organisations and agencies for carrying out the field level activities;
3. To identify institutions for carrying out activities that could be applied in the field directly;
4. Strengthening of laboratories for carrying out analytical work;
5. Develop and implement viable models of public-private partnerships for setting up and operating common treatment storage disposal facilities for toxic and hazardous waste, industrial and Bio-Medical Waste, on payment by users;
6. Develop and implement strategies for clean up of pre-existing toxic and hazardous waste dumps, in particular, in industrial areas, and reclamation of such land for future, sustainable use;
7. Give legal recognition to, and strengthen the informal sector systems for collection and recycling of various materials; in particular enhance their capacity and provide access to appropriate technologies and institutional finance;
8. Provide subsidy or tax exemption to waste management activities;
9. Sales and service tax exemption for recyclable waste that is recycled in an environmentally sound manner;

⁶² Government of India, Report of the Steering Committee on the Environment and Forests Sectors for the Eleventh Five Year Plan, 2007-2012 pg. 21 Planning Commission, New Delhi, (2007).

⁶³ *Ibid* at pgs. 54-55.

10. Facilitate demonstration projects and provide subsidies for application of new technologies such as plasma technology for more efficient and environment friendly disposal hazardous wastes.

Bio-Medical Waste:

1. To facilitate in establishing more common and shared facilities;
2. Specific training programmes to be funded and organised for the medical professionals, paramedical professionals and other staff working in the health care institutions;
3. Special training programmes for safai karamcharis;
4. Awareness programmes to be organized through media and other sources for general public; and
5. To involve local communities and NGO's.

Under the 12th five year plan⁶⁴, the main emphasis is on “Managing the Environment and Ecology”. The Planning Commission has identified twelve Strategy Challenges for the approach paper with the five components and the Waste management and Pollution Abatement being one of the important components has find places in it. This includes bio-medical waste management. The management of waste being an important part of the general expectations of the citizens covering healthy surroundings must be given utmost priority so the citizens can live in a pollution free environment. The 12th Plan has suggested for the institutional mechanisms, infrastructure and science and technology in the management of environment and ecology and it has also specifically suggested the following measures⁶⁵:

1. Encourage 4 R's (Recycle, Reuse, Reduce and Remanufacture) and co-processing of Hazardous Waste for recovery of energy.
2. Incentivise public-private partnership for creating the required infrastructure for Setting up of Treatment Storage and Disposal Facilities (TSDF) for hazardous waste management across the country.

⁶⁴ 2012-2017.

⁶⁵ Government of India, Managing the Environment and Ecology, Twelveth Five Year Plan 2012-2017 pg. 4, Planning Commission.

3. Ensure Segregation of Bio-medical wastes as per existing rules and the infectious and hazardous wastes treated in dedicated facilities. Common facilities are to be setup.

4. Enhance recycling facilities for E-wastes in the country.

5. Ensure Municipal solid waste segregation, collection and setting up of facilities for complete disposal. Where ever possible recycling and processing has to be ensured during the 12th Plan to protect our people and the environment.

6. Green belt for dust and noise abatement and odour mitigation is considered essential.

Therefore, according to the approach paper of 12th five year plan the problem relating to bio-medical waste management has given emphasis considering it as an important aspect of environmental concern and if it can be successfully implemented it would be a great achievement the fruit of which can be seen in near future.

7.2.7 The Bio-Medical Waste Management⁶⁶ Rules, 2016

“New Bio-Medical Waste Management Rules will change the way Country used to manage waste earlier; make a big difference to Clean Indian Mission”: Shri Prakash Javadekar, Union Minister of State (IC) Environment, Forest & Climate Change⁶⁷.

Notified on March, 28, 2016 in the Gazette of India, the Centre published new Rules for the management of bio-medical wastes in the country and prescribes more stringent standards for incinerators to reduce emissions and envisage the creation of a bar-code system for bags containing such refuse. The Rules is applicable to all providing “health care facility” and according to Rule 3(j) of the new Rules it means a place where diagnosis, treatment or immunisation of human beings or animals is provided irrespective of type and size of health treatment system, and research activity pertaining thereto. The Rules also bring vaccination, blood donation and

⁶⁶ As per the Bio-Medical Waste Management Rules, 2016 the word ‘Management’ includes ‘Handling’.

⁶⁷ New Rules Notified for Management of Bio-Medical Waste, *The Times of India*, March 27, 2016.

surgical camps under its ambit while providing for pre-treatment of laboratory and microbiological waste and blood samples and bags on-site as prescribed by the World Health Organisation (WHO) and National Aids Control Organisation (NACO)⁶⁸. Apart from the above mentioned features the Bio-Medical Wastes Management Rules, 2016 laid down the following feature:

- a) The ambit of the rules has been expanded to include vaccination camps, blood donation camps, surgical camps or any other healthcare activity.
- b) Phase-out the use of chlorinated plastic bags, gloves and blood bags within two years.
- c) Pre-treatment of the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by WHO or NACO.
- d) Provide training to all its health care workers and immunise all health workers regularly.
- e) Establish a Bar-Code System for bags or containers containing bio-medical waste for disposal.
- f) Report major accidents.
- g) Existing incinerators to achieve the standards for retention time in secondary chamber and Dioxin and Furans within two years.
- h) Bio-medical waste has been classified in to 4 categories instead 10 to improve the segregation of waste at source.
- i) Procedure to get authorisation simplified. Automatic authorisation for bedded hospitals. The validity of authorization synchronised with validity of consent orders for Bedded HCFs. One time authorisation for Non-bedded HCFs.
- j) The new rules prescribe more stringent standards for incinerator to reduce the emission of pollutants in environment.
- k) Inclusion of emissions limits for Dioxin and furans.
- l) State Government to provide land for setting up common bio-medical waste treatment and disposal facility.

⁶⁸ *Ibid.*

- m) No occupier shall establish on-site treatment and disposal facility, if a service of `common bio-medical waste treatment facility is available at a distance of seventy-five kilometer.
- n) Operator of a common bio-medical waste treatment and disposal facility to ensure the timely collection of bio-medical waste from the HCFs and assist the HCFs in conduct of training

Although we have new Bio-Medical Waste Management Rules, 2016, but any discussion on this Rule without an extensive analysis of the Bio-medical Waste (Management & Handling) Rules, 1998 including its amendments⁶⁹ would be futile because if the researcher confines its analytical research only on the new Rules, 2016 it would not be possible to extract and identify the actual problems and a fair doctrinal research would be far from the truth. Therefore, in order to get a detailed overview of the existing Rules it is important to make an extensive analysis of the Bio-medical Waste (Management & Handling) Rules, 1998 including its amendments to understand the subject properly.

7.3 An Overview of the Bio-Medical Waste (Management & Handling) Rules, 1998 and its amendments including the draft Bio-Medical Waste (Management & Handling) Rules, 2011

The Environment (Protection) Act, 1986 makes possible the issuance of many rules and notifications. Incidentally, in 1989 the Government of India, in exercise of powers conferred under sections 6⁷⁰, 8⁷¹ and 25⁷² of the Environmental (Protection) Act, 1986 formulated the Hazardous Waste (Management & Handling) Rules, 1989.

⁶⁹ 1st Amendment was made on 06/03/2000, 2nd on 17/09/2003 and on 24/08/2011 a draft Bio-medical Wastes Rules, 2011, the 3rd Rules was notified.

⁷⁰ Section 6 (1) of the Environmental (Protection) Act, 1986 says-The Central Government may, by notification in the Official Gazette, make rules in respect of all or any of the matters referred to in Section 3. (2) In particular, and without prejudice to the generality of the forgoing power, such rules may provide for all or any of the following matters, namely: (a) The standards of quality of air, water or soil for various areas and purposes. (b) The maximum allowable limits of concentration of various environmental pollutants (including noise) for different areas. (c) The procedures and safeguards for the handling of hazardous substances. (d) The prohibition and restrictions on the handling of hazardous substances in different areas. (e) The prohibition and restrictions on the location of industries and the carrying on of processes and operations in different areas. (f) The procedures and safeguards for the prevention of accidents which may cause environmental pollution and for providing for remedial measures for such accidents.

⁷¹ The Section states that “No person shall handle or cause to be handled any hazardous substance except in accordance with such safeguards as may be prescribed”.

⁷² The Section deals with “power to make rules”. The Section reads as, “the procedure in accordance with and the safeguards in compliance with hazardous substances shall be handled or caused to be handled under Section 8”.

At the time of formulation of the hazardous waste Rules there was no such intention to include the bio-medical wastes which involved within its ambit, some elements of hazardous wastes also, although in a very small quantity. Later on, a draft notification on Bio-Medical Wastes (Management and Handling) Rules, 1995 was issued on 24th April, 1995 vide S.O. 378(E) II 3(ii) Gazette of India Extra., Sl. No.19 and objections were invited from public. After duly considering necessary amendment in the Draft Rules, the Bio-Medical Waste (Management & Handling) Rules, 1998 finally came into operation with effect from 20th July, 1998 vide S.O. 630 (E) II 3(ii), Gazette of India, Extra Serial No. 460. These Rules are applicable to all persons who generate, collect, receive, store, transplant, dispose or handle Bio-Medical Waste in any form.

The Rules contain 14 Sections, 6 Schedules and 5 Forms. Primarily the Rules focus on management and handling of bio-medical waste by prescribing standards as to treatment and disposal. As a corollary, these Rules mandate compliance of different procedures as to segregation, packaging, transportation and storage. These Rules also create duties on every occupier of an institution generating bio-medical waste, which includes hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank etc. These Rules also envisages a prescribed authority for the purpose of enforcement.

7.3.1 Meaning of Bio-Medical Waste

The analysis of the various provisions of the bio-medical waste Rules is not possible and would remain incomplete without understanding the meaning of various terms that have been defined under it. The exact interpretation of those provisions would be possible only if they are interpreted in the light of those terms whenever confusion arises and this would help in understanding properly the scope and ambit within the framework of which the justification of those provisions can fairly be made.

According to Sub-rule (5) of Rule 3 of the Bio-Medical Waste (Management & Handling) Rules, 1998, Bio-Medical Waste means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biological and including categories mentioned in Schedule I.

According to Rule 3(6) “biologicals” means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunisation or for the treatment of human beings or animals or in research activities pertaining thereto.

In this connection it is important to highlight on some important points that has brought changes in the definition of the term ‘bio-medical waste’. Originally, the term ‘bio-medical waste’ did not include ‘health camps’. But under the new Rules, 2016 the scope of the definition has given a wide range with regard to its applicability including health camp also. While in 2011, the bio-medical waste Rules 1998 were amended to include all persons who generate, collect, receive, store and transport such waste, the new Rules 2016 bring more clarity by specifying that vaccination camps, blood donation camps, surgical camps and all other health care facilities have been included.

7.3.2 Applicability of the Rules

The scope of the applicability of the new Rules has been broadened under Rules 2 to include within its domain all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio-medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, ayush hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs. It is also applicable to those providing health care facilities at home. Earlier, as per the bio-medical waste Rules, 1998 read with the draft bio-medical waste Rules 2011, it was confined only to all who generate, collect, receive, store, transport, treat, dispose, or handle such waste and thereby created confusions as to who are those specific persons to be brought within the purview of this Rules. The new Rules, 2016 has cast away all the doubts with regard to its applicability making it specific and the controversy which existed has been set off so far. The new Rules also made it clear by providing detail specification as to whom this Rules are not applicable. Thus, according to the new Rules, it shall not apply to radioactive wastes, hazardous chemicals, solid wastes, lead batteries, hazardous wastes, e-waste and hazardous micro organisms as these wastes comes under the

respective Acts/Rules⁷³ enacted so far to tackle the same. This is because the persons who are handling all the above types of wastes are already covered by the respective Acts/Rules and in case of violation of either of the Acts or Rules, an action would successfully be made for not following the strict regulations in this connection.

7.3.3 Categories/Types⁷⁴ of Bio-Medical Waste

As per the Bio-Medical Waste (Management & Handling) Rules 1998, the bio-medical waste has been grouped into the following ten categories/types under Schedule I:

1. Human Anatomical Waste: Pathological waste consists of human tissues, organs, body parts, human fetuses, blood, body fluids.
2. Animal Waste: This category contains animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospitals, animal houses.
3. Microbiology & Biotechnology Waste: Wastes from laboratory cultures stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures.
4. Waste Sharps: Sharps are items that could cause cuts or puncture wounds. This category includes needles, hypodermic needles, syringes, scalpels, blades, knives, infusion sets, saws, broken glass and nails. This includes both used and unused sharps. Owing to their property of invading the primary defence barrier of the body i.e. the skin they are the most potent way of transmission of blood borne pathogens.
5. Discarded Medicines and Cyto-toxic Drugs: Such waste comprised of outdated contaminated and discarded pharmaceutical products, drugs, vaccines and sera. Cytotoxic or antineoplastic drugs, the principal substances in this

⁷³ For example, The Atomic Energy Act, 1962, The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989, The Municipal Solid Waste (Management and Handling) Rules, 2000, The Batteries (Management and Handling) Rules, 2001, The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008, etc.

⁷⁴ 2nd Amendment, 2000 of the Rule: In the sub-heading, after the words, “waste category” the word “Type” shall be added.

category, have the ability to kill or stop the growth of certain living cells and are used in chemotherapy of cancer.

6. Solid Waste⁷⁵: Items contaminated with blood and body fluids including cotton, dressings, soiled plaster casts, linens, beddings, other materials contaminated with blood.

7. Solid Waste: Wastes generated from disposable items other than the waste sharps⁷⁶ such as tubings, catheters, intravenous sets etc. Basically these include plastics used in patient care.

8. Liquid Waste: Waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities.

9. Incineration Ash: Incineration ash of any biomedical waste is categorized as hazardous waste under the Hazardous Waste Rules. The ash can have heavy metals and can be contaminated with toxins such as dioxins and furans.

10. Chemical Waste: Chemicals used in production of biological and chemicals used in disinfection, as insecticides etc.

It is interesting to note that the Bio-Medical Waste (Management and Handling) Rules 1998 which was originally contained ten categories of wastes have been reduced to eight under the draft Bio-Medical Waste (Management & Handling) Rules, 2011. The 2011 Rules have discarded Category No. 8 (containing liquid waste generated from laboratory, cleaning and washing and disinfection activities) and Category No. 9 (containing incineration ashes). However, laboratory wastes listed in Category 8 has been included in the present Category 1 under the head of type of waste⁷⁷. The reduction of number of various categories/types to minimum is with a view to avoid confusions and overlapping regarding the use of various colour coded containers/bags. It has been seen that so long there exist as many containers/bags of different colours, there is every possibility of mixing up of a particular type of waste with the others and the very purpose of management of the bio-medical wastes gets be affected. This is due to the fact that for the proper management of such wastes the very first step is to segregate the same by identifying of specific colour coded containers/bags where specific categories/types of the wastes are to be kept for the

⁷⁵ By the 2nd amendment made in 2003 the word “soiled” is substituted by “solid”.

⁷⁶ “Sharps” has been substituted in place of “Shapr”.

⁷⁷ Category 1(f), Schedule I of the Bio-Medical Waste Management Rules, 2016.

time being not beyond a period of forty eight hours⁷⁸ and thereafter the same is to be send for proper treatment as per the existing Rules. This would not only help in reducing the cost of keeping many containers/bags, the risk factor involved in handling the hazardous nature of the bio-medical wastes would also reduced. This would also foster the proper treatment and disposal of the wastes as per the provisions of the Rules to overcome the difficulties. If situation exist and it would not be possible to follow the next step beyond the prescribed period, the occupier shall take appropriate measures to ensure that the waste does not adversely affect human health and the environment and inform the prescribed authority along with the reasons for doing so.

Unlike the draft Rules, 2011, the Bio-Medical Waste Management Rules, 2016 also has made a drastic step by further reducing the categories of bio-medical waste to four only and thereby made an effort to clear all the ambiguities that had existed earlier under the previous draft Rules and its amendments. The different types of bio-medical wastes that have been placed under four categories of the Bio-Medical Wastes Management Rules, 2016⁷⁹, are as follows:

7.3.3.1 Category I

- a. Human and Animal Anatomical Waste- Consisted of Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).
- b. Animal Anatomical Waste- Such waste includes experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.
- c. Soiled Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.

⁷⁸ As per Rule 8(7) of the Bio-Medical Waste Management Rules, 2016, maximum period prescribed is 48 hours.

⁷⁹ SCHEDULE I [See rules 3 (e), 4(b), 7(1), 7(2), 7(5), 7(6) and 8(2)] Part-1 of the Bio-Medical Wastes Management Rules, 2016.

- d. Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.
- e. Chemical Waste: Chemicals used in production of biological and used or discarded disinfectants.
- f. Chemical Liquid Waste : Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities etc.
- g. Discarded linen, mattresses, beddings contaminated with blood or body fluid.
- h. Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of microorganisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.

7.3.3.2 Category II

Contaminated Waste (Recyclable) is divided into (a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and (b) vaccutainers with their needles cut and gloves.

7.3.3.3 Category III

Termed as Waste Sharps such category consists of metals, needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes used, discarded and contaminated metal sharps.

7.3.3.4 Category IV

- a. Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.
- b. Metallic Body Implants

An interesting development in the waste category is that contaminated waste which is recyclable, waste sharps including metals and glassware and metallic body implants are the three categories of bio-medical wastes that has find places under the Rules, 2016. It is to be noted that the reduction of the number of category does not mean the removal of particular type of waste from the purview of the new Rules, it has, in fact, by way of including new types of wastes extended the ambit of the Rules. The purpose behind such reduction in four categories is to avoid the confusion that was subsisted earlier with regard to the use of particular type of colour coded containers/bags at the time of segregation of different types of wastes. Now considering the nature of the wastes and to remove such confusions, Category I included eight numbers of categories of wastes that is to be stored only in one colour coded container i.e. yellow container or bag with a view to follow the appropriate treatment and disposal methods.

7.4 The Process of Segregation of Bio-Medical Waste

After identifying different categories of wastes mentioned above, the next important step to be followed is the segregation. This would help in the effective management⁸⁰ of the bio-medical waste because if the different types of such waste are not segregated properly, the whole process of management would be in vein. For the purpose of segregation, such wastes can be broadly classified into the following categories:

- General or non-hazardous/non-infectious medical waste.
- Infectious or hazardous medical waste.

In the process of minimising the risk factor present in the bio-medical waste, segregation is considered as the most important steps that needs careful attention

⁸⁰ Rule 3 (1) of the Bio-Medical Waste Management Rules, 2016 defines management as “management” includes all steps required to ensure that bio- medical waste is managed in such a manner as to protect health and environment against any adverse effects due to handling of such waste.

because if the non-hazardous bio-medical waste involving zero risk factor is not segregated from hazardous bio-medical waste of highly infectious in nature, the whole wastes would become infectious and the whole process of bio-medical waste would be jeopardised.

Under the Rule 6⁸¹ of the Bio-Medical Waste (Management & Handling) Rules, 1998 provision have prescribed for segregation of the bio-medical wastes. According to Sub-rule 2 of Rule 6, the waste shall be segregated into containers/bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. Schedule II prescribed different coloured disinfected and puncture proof plastic bags/containers in which specific categories of bio-medical wastes are to be packed after identifying its nature except liquid and chemical wastes. Such wastes being liquid is to be disinfected at the first instance and then to discharge into the drain.

On the other hand under Rule 8(2) of the Bio-Medical Waste Management Rules, 2016 such waste categorised four in number shall be segregated into containers or bags at the point of generation in accordance with Schedule I prior to its storage, transportation, treatment and disposal. While segregating the particular bio-medical waste the first step would be to identify it and then segregate the same in accordance with the Rules. The identification of the particular type of wastes is very important in the sense that if properly identified, it would help in reducing the risk factor involved in such waste and thereby would foster towards the management and eradicating the problem of the bio-medical wastes. The present Rule prescribed with same rule as it was present under the draft Bio-Medical Waste (Management & Handling) Rules, 2011. In addition, the second part of Schedule I i.e. Part 2 of the Bio-Medical Waste Management Rules, 2016 lay down that all plastic bags shall be as per BIS standards as and when published, till then the prevailing Plastic Waste Management Rules shall be applicable. Such additional protection is with a view to insisting on the use of punctured proof plastic bags so that the risk factor involved in the use of ordinary plastic bags could be avoided. If any accident takes place due to the use of such plastic bags, unlike the draft Rule, 2011, the new Rule, 2016 has strictly requested for

⁸¹ Rule 6(2) of the Bio-Medical Waste Management Rules, 2016: “Bio-Medical Waste shall be segregated into containers or bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. The containers shall be labeled according to Schedule III.

reporting accidents that might take place at the time of handling⁸² the same right from segregation till its disposal. Under Rule 15, in case of any major accident⁸³ at any institution or facility or any other site while handling bio-medical waste, the authorised person shall intimate immediately to the prescribed authority about such accident and forward a report within twenty-four hours in writing regarding the remedial steps taken in Form I. Information regarding all other accidents and remedial steps taken shall be provided in the annual report in accordance with rule 13 by the occupier.

7.5 Duty of the Occupier⁸⁴ in segregating of Bio-Medical Waste

The new Rules 2016 has, as part of segregation, imposes certain duties on the occupier under Rule 4 which are as follows:

- Duty to make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste in colored bags or containers in the manner as specified in Schedule I. Such duty also include that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals⁸⁵.
- Duty to immunise all its health care workers and others, involved in handling of bio-medical waste for protection against diseases including Hepatitis B and Tetanus that are likely to be transmitted by handling of bio-medical waste, in the manner as prescribed in the National Immunisation Policy or the guidelines of the Ministry of Health and Family Welfare issued from time to time⁸⁶.

⁸² Rule 3(i) of the Bio-Medical Waste Management Rules, 2016 defines ‘handling’ in relation to bio-medical waste includes the generation, sorting, segregation, collection, use, storage, packaging, loading, transportation, unloading, processing, treatment, destruction, conversion, or offering for sale, transfer, disposal of such waste.

⁸³ Under Rule 3(k) of the Bio-Medical Waste Management Rules, 2016 ‘major accident’ means accident occurring while handling of bio-medical waste having potential to affect large masses of public and includes toppling of the truck carrying bio-medical waste, accidental release of bio-medical waste in any water body but exclude accidents like needle prick injuries, mercury spills.

⁸⁴ As per Rule 3(m) of the Bio-Medical Waste Management Rules, 2016 ‘occupier’ means a person having administrative control over the institution and the premises generating bio-medical waste, which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, health care facility and clinical establishment, irrespective of their system of medicine and by whatever name they are called;

⁸⁵ Rule 4 (b) of the Bio-Medical Waste Management Rules, 2016.

⁸⁶ Rule 4 (h) of the Bio-Medical Waste Management Rules, 2016.

- To ensure segregation of liquid chemical waste at source and ensure pre-treatment or neutralisation prior to mixing with other effluent generated from health care facilities⁸⁷.
- For ensuring occupational safety of all its health care workers and others involved in handling of biomedical waste the occupier should provide with appropriate and adequate personal protective equipments⁸⁸.
- To conduct health check up at the time of induction and at least once in a year for all its health care workers and others involved in handling of bio- medical waste and maintain the records for the same⁸⁹.

Similar duties have been conferred on the operator of the common bio-medical waste treatment and disposal facilities which is discussed separately in this chapter.

It is interesting to note that in the Bio-Medical Waste (Management & Handling) Rules, 1998 there was no specific mention of the duty to be discharged by the occupier at the time of handling or segregating such waste. Rule 4⁹⁰ prescribed the duty in general without mentioning it specifically. It created confusions as to what are those specific duties the non-fulfillment of which would make the occupier responsible. To remove such difficulties the draft Bio-Medical Waste (Management & Handling) Rules, 2011 lay down certain additional duties relating to the segregation which is to be read along with the general duty formulated under the Rules of 1998. Under the new Rules, 2016, there are altogether twenty duties that are required to be discharged by the occupier in the process for the management of bio-medical waste to ensure that while handling of such waste it should not have any adverse effect to human health and the environment⁹¹.

In order to ensure whether the health care institutions are acting in accordance with the Rule, Rule 14 prescribed the duty on the authorised person⁹² for the

⁸⁷ Rule 4 (j) of the Bio-Medical Waste Management Rules, 2016.

⁸⁸ Rule 4 (l) of the Bio-Medical Waste Management Rules, 2016.

⁸⁹ Rule 4 (m) of the Bio-Medical Waste Management Rules, 2016.

⁹⁰ Under Rule 4 of the Bio-Medical Waste Management Rules, 2016, It shall be the duty of every occupier of an institution generating bio-medical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.

⁹¹ Rule 4 (a) of the Bio-Medical Waste Management Rules, 2016.

⁹²Rule 3 (d) of the Bio-Medical Waste Management Rules, 2016 defines authorized person as “authorised person” means an occupier or operator authorised by the prescribed authority to generate, collect, receive, store, transport, treat, process, dispose or handle bio-medical waste in accordance with

maintenance of records in connection with the generation, collection, reception, storage, transportation, treatment, disposal or any other form of handling of bio-medical waste, for a period of five years as per the rules and guidelines issued by the Central Government or the Central Pollution Control Board or the prescribed authority as the case may be which will be verified and inspect by the prescribed authority or the Ministry of Environment, Forest and Climate Change at any time.

7.6 The Process of Packaging into the Colour Coded Containers/Bags

After segregation of the bio-medical wastes the same is to be packed or stored into the containers/bags of specific colours. According to Rule 6 of the Bio-Medical Waste (Management & Handling) Rules, 1998, after segregation of wastes into infectious and non-infectious category it should be packed properly. The infectious waste which has packed into specific colour coded containers/bags shall be treated and disposed of in accordance with Schedule I. The non-infectious or non-hazardous waste shall be picked up and transported by the Municipal authority at municipal dump site. Schedule II of the Rules, 1998 provides for colour coding for the containers/bags in order to segregate the biomedical waste appropriately which are:

- Yellow plastic bag that needs to incinerate or deep buried may contain human anatomical waste, animal waste, microbiological waste and soiled waste.
- Red disinfected container or plastic bag that need to be autoclave, disinfected with chemical, or microwaved used for plastic waste and chemical treatment for microbiological waste, soiled waste and solid waste.
- Blue or white plastic bag or puncture proof container need to autoclave, microwave, chemical treatment and destruction or shredding which includes wastes like waste sharps, solid waste etc.
- Black plastic bag that used to be sent for secured landfill or burial incineration, used for discarded medicines and cytotoxic drugs, and chemical solid waste.

these rules and the guidelines issued by the Central Government or the Central Pollution Control Board, as the case may be.

Although, Schedule II of the Rule provides for a number of options or alternatives in establishing a colour coded waste management and segregation systems but it has introduced too many colour coded bags. It is very difficult to accommodate all colour coded bags in valuable space of the hospital. This raises the complexities for which an effective system should be adopted which will provide a simple method. As per the draft Bio-Medical Waste (Management & Handling) Rules, 2011 untreated bio-medical wastes shall not be mixed with other wastes and shall be segregated into four types of colour coded containers/bags at the point of generation in accordance with Schedule II. There was overlapping with regard to colour coding and segregation of waste. For instance, wastes under category 3 and 6 can be collected either in yellow or red bags. Similarly, wastes under category 7 may be collected either in red or blue bags. This caused confusion in segregation. In the Rules, 2011 colour coding for containers for collection of various categories of bio-medical wastes has been clearly specified to avoid overlapping and confusion by way of allotting one colour code to each category of waste.

Under the new Bio-Medical Waste Management Rules, 2016 also the number of colour coded containers has reduced to four in number (yellow, red, white and blue) and included the same in Schedule I along with the different categories of wastes and thereby tried to remove all the difficulties existed earlier while handling the particular type of wastes using appropriate containers/bags. The minimisation of the colour coded containers/bags does not mean that a particular kind of biomedical waste is not being adhered to. What it means is that all types of wastes have been compiled in four categories for ease of segregation at a healthcare facility. For example, for category I waste (eight in number) yellow coloured non-chlorinated bags have been prescribed. Red coloured non-chlorinated plastic bags or containers has been prescribed for category II type of waste. White translucent puncture proof, leak proof and tamper proof containers are for category III type of waste and lastly, for category IV wastes, i.e. glassware, metallic body etc. cardboard boxes with blue coloured marking have been prescribed.

The Rules, 2016 also talked about phasing out of the chlorinated plastic bags, gloves and blood bags within two years to eliminate emission of dioxins and furans from burning of such wastes. According to Part 2 of Schedule I all plastic bags shall be as per BIS standards as and when published, till then the prevailing Plastic Waste

Management Rules shall be applicable. A bar code system has also provided for by imposing a duty on the occupiers and the operators of common waste treatment facility under Rule 4 (i) and Rule 5(c) respectively to establish the same for bags/containers containing bio-medical waste and immunisation of health workers upon their induction and after every one year interval.

The following are the criteria recommended by the International Committee of Red Cross for choosing plastic bags: appropriate size for the container and the quantity of waste produced, sufficiently thick (70 µm – ISO 7765 2004) and of suitable quality (tear-resistant), non-halogenated plastic (no PVC). Anatomical waste cannot always be collected in yellow plastic bags for cultural or religious reasons. It must be treated in accordance with local customs (often buried). Chemical and pharmaceutical wastes must be sorted and treated separately. The sub-categories include mercury wastes, light bulbs, batteries, photographic developers, laboratory chemicals, pesticides and medicines. Bags and containers must be closed whenever they are two-third full⁹³.

7.7 Labelling

Another important step in the process of the management of bio-medical wastes after segregating and storing the same in different containers/bags is the labelling of the containers/bags. Strict rules have been prescribed by taking special care of the wastes which is infectious in nature. Under Schedule III of the Bio-Medical Waste (Management & Handling) Rules 1998 read with Rule 6 it is prescribed that such containers/bags should be non-washable and there should prominently visible the tag 'handle with care'. According to sub-Rule 2 of Rule 6 the containers/bags shall be labelled according to Schedule III. Provision has also been lay down for the label of the vehicle transporting the bio-medical wastes under Schedule IV read with Rule 6. In addition to the label prescribed in Schedule III, the label on the vehicle should consist of the detailing as to the waste category number, classes of waste alongwith the sender's and receiver's name and address on it including phone number, telex number etc. Under sub-Rule 3 of Rule 6 if a container

⁹³ International Committee of the Red Cross, "Medical Waste Management" pgs. 72-73, (November, 2013), Available at: <https://www.icrc.org/eng/assets/files/publications/icrc-002-4032.pdf> (Last visited on Nov. 3, 2016).

is transported from the premises where bio-medical waste is generated to any waste treatment facility outside the premises, the container shall, also carry information as per Schedule IV.

Rule 8(3) and 8(5) of the Bio-Medical Waste Management Rules, 2016 have provided with the same criteria to be complied, with minor changes. Under the earlier Rules, 1998 although mention was made of labelling of the containers/bag as well as of vehicle carrying the waste but it did not make anyone responsible if the same is not followed. The new Rule by way of casting duty on the operator of the common bio-medical waste treatment facilities prescribed that for the purpose of off-site bio-medical waste treatment and disposal the vehicle carrying the same should be labeled as provided in the Schedule IV Part A. The criteria are the same as it was provided under the old Rule. Whereas Part B lays down for the label of vehicle carrying such wastes along with necessary information as required which is also same as it was in the earlier Rule.

7.8 Treatment and Disposal

The purpose of treatment is to reduce the potential hazard present in the bio-medical waste so that it would be possible to protect the environment from its harmful effect. Rule 5 read with Schedule I of the Bio-Medical Waste (Management & Handling) Rules, 1998 provides large number of modes through which a particular bio-medical waste shall be treated and disposed of. These include incineration, autoclaving, microwaving, mutilation or shredding, chemical treatment or disinfection, land fill and deep buried and discharge in drains. Syringes, needles and gloves after use should always be disinfected with freshly prepared bleaching powder solution, i.e. 1% hypochlorite solution or autoclaved before mutilation or shredding. Such treatment and disposal was to be made in accordance with the standards prescribed in Schedule V. Different treatment and disposal methodology have been prescribed under the Bio-Medical Waste (Management & Handling) Rules, 1998, for example, for categories 1, 2, 3 only incineration treatment method have been provided. For categories 4 autoclaving, microwaving, mutilation or shredding, for categories 5 and 6 alongwith incineration, destruction and disposal in secured landfills and autoclaving or microwaving treatment methods have been prescribed. For solid (category 7), liquid (category 8) and chemical (category 10) wastes, disinfection by

chemical treatment with autoclaving or microwaving and thereafter discharge into drains are required to be followed and finally for category 6 waste disposal in municipal landfill is to be adopted.

Schedule II read with Rule 6 of the same Rules, 1998 also prescribed treatment and disposal of colour coded containers/bags. Incineration/deep burial is for yellow plastic bags (categories 1, 2, 3 and 6). Red disinfected containers/plastic bags consisting of wastes of categories 3, 6 and 7 are to be autoclaved or microwaved including chemical treatment. For category 4 and 9, where blue or white translucent plastic puncture proof bag has been prescribed, the treatment and disposal methods that have been prescribed for Categories 3, 6, and 7 was to be adopted. Lastly, the black plastic bags had to be disposed of in secured landfill containing wastes of categories 5, 9 and 10. It is also prescribed under the note of the Schedule that the waste collection bags for collection of different types of wastes which shall be incinerated should not be of chlorinated plastic because the toxin and furans that will be formed during incineration are harmful to the environment. Categories 8 and 10 do not required any containers/bags being liquid waste and for the same different treatment methods have been prescribed.

Under the draft Bio-Medical Waste (Management & Handling) Rules, 2011 also the above said options have been prescribed despite the fact that some of such treatment and disposal methods are not environment friendly and constantly posing threat forgetting its ill-effect in the environment. The Rules also had not stated where an on-site treatment facility is necessary and where dependence on a common bio-medical waste treatment is justified. It also did not mention who will provide land for setting up of the same.

To overcome such problem the Bio-Medical Waste Management Rules, 2016 make necessary changes which are a welcome attempt in this regard to make the whole treatment and disposal methods more effective. As for instance, in the definition of the phrase 'bio-medical waste treatment and disposal facility' which is relevant in connection with treatment and disposal certain changes have been made and the inclusion of the phrase 'common bio-medical waste treatment facilities' is such a step in this regard. Accordingly, under the new Rules, 2016 it means any facility wherein treatment, disposal of bio-medical waste or processes incidental to

such treatment and disposal is carried out, and includes common bio-medical waste treatment facilities.⁹⁴

Changes has also made in connection with the treatment and disposal options. Under the new Rules, 2016 options like ‘plasma pyrolysis’, ‘waste sharps dry heat sterilisation followed by shredding or mutilation or encapsulation in metal container or cement concrete’, ‘pre-treatment to sterilise with non-chlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for incineration’ etc. have been included with a view to make the treatment and disposal options more environment friendly. The inclusion of new technological treatment and disposal is with a view to reduce the harmful effect in the environment that may arise if a specific treatment methodology is followed regarding the treatment of a particular category of waste without strictly fulfilling such criteria. It is to be noted here that during the last five years, the Central Pollution Control Board has also granted conditional or provisional approval to new technologies of the above types other than notified under earlier bio-medical waste Rules for treatment of bio-medical waste⁹⁵.

The expression plasma pyrolysis is a method of treatment of the plastic items. Plasma pyrolysis uses extremely high temperatures of plasma-arc in an oxygen starved environment to completely decompose waste material into simple molecules. Hot plasmas are particularly appropriate for treatment of solid waste and can also be employed for destruction of toxic molecules by thermal decomposition. Unlike incinerators, segregation of chlorinated waste is not essential in this process. Another advantage of plasma pyrolysis is the reduction in volume of organic matter, which is more than 99%. Based on numerous advantages of plasma technology it is speculated that in the near future, plasma pyrolysis reactors will be widely accepted for toxic waste treatment⁹⁶. Unlike their smoke-belching, conventional counterparts, plasma pyrolysis facilities burn the waste without producing any harmful residuals. In plasma pyrolysis the quantity of toxic residuals (dioxins and furans) is much below the accepted emission standards and it does not require segregation of hazardous waste.

⁹⁴ Rule 3(g) of the Bio-Medical Waste Management Rules, 2016.

⁹⁵ Government of India, Ministry of Environment & Forest, “Bio-Medical Waste Management: An Overview” Environmental Information system (ENVIS), Newsletter, Central Pollution Control Board pg. 16 (2014).

⁹⁶ S. K. Nema and K. S. Ganeshprasad, “Plasma Pyrolysis of Medical Waste” Vol. 83 Current Science pg. 273 (2002).

In addition, the pathogens are completely killed and there is a possibility to recover energy⁹⁷.

In the new Rules, 2016 along with the earlier treatment and disposal options it has included new technological options in order to remove the difficulties that was in existence in the previous treatment technologies. Reference may be made of the treatment technologies like autoclaving, microwaving or hydroclaving with regard to the treatment of particular type of waste e.g. soiled waste. After adopting any of these treatment options and successful completion of the same, the further steps to be followed is shredding or mutilation or combination of sterilisation and shredding for the same category and lastly the treated waste is to be sent for energy recovery. Such additional steps are required to be followed with a view to root out the risk factor absolutely as it was found present following the treatment method as per the Rule, 1998. It means that the earlier treatment methods were not out of risk. Likewise, the method which was earlier prescribed for the treatment of chemical waste under the previous Rule, 1998 is different from and a new method for the disposal of the same either by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility has been provided under the new Rules, 2016. It seems that for the treatment of such waste the method provided under the previous Rule was not enough and a new technology was needed for the same and accordingly the new Rules by the inclusion of new treatment method made an attempt to remove the difficulties existed earlier. Further, for the treatment of the waste sharps consisting of needles, syringes, scalpels, blades etc. also the option prescribed is new compare to the previous options. Along with autoclaving, dry heat sterilisation followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving and finally the residue shall be sent for final disposal to iron foundries or sanitary landfill or designated concrete waste sharp pit have been prescribed. Previously it was limited only to autoclaving or microwaving including shredding and mutilation.

The new Rules, 2016 also added new provision for three 'R's' i.e. reduce, recycle and reuse relating to contaminated waste prescribed in the Schedule I under the treatment and disposal options. For recyclable contaminated wastes which were earlier included under the category of solid waste, autoclaving or micro-waving/

⁹⁷ *Ibid.*

hydroclaving followed by shredding or mutilation or combination of sterilisation and shredding have been prescribed. The treated waste is to be sent to registered or authorised recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible.

Regarding deep burial, an old option for the treatment and disposal of the bio-medical waste, the new Rules, 2016 brought some changes. According to the Schedule I disposal by deep burial is permitted only in rural or remote areas where there is no access to common bio-medical waste treatment facility and the same is to be carried out with prior approval from the prescribed authority and as per the Standards specified in Schedule-III. The site of the deep burial shall be as per the provisions and guidelines that has been issued or to be issuable from time to time by the Central Pollution Control Board.

In addition to the above, Part 2 of the Schedule I of the new Rules, 2016 prescribed for the adoption of various other treatment options which is significant from the point of view that it would help in reducing the pollution in the environment if followed properly in according with the Rules. They are as under:

1. Chemical treatment using at least 10% Sodium Hypochlorite having 30% residual chlorine for twenty minutes or any other equivalent chemical reagent that should demonstrate Log₁₀4 reduction efficiency for microorganisms as given in Schedule- III.
2. Mutilation or shredding must be to an extent to prevent unauthorised reuse.
3. There will be no chemical pre-treatment before incineration, except for microbiological, lab and highly infectious waste.
4. Incineration ash (ash from incineration of any bio-medical waste) shall be disposed through hazardous waste treatment, storage and disposal facility, if toxic or hazardous constituents are present beyond the prescribed limits as given in the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 or as revised from time to time.
5. Dead Fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time) can be considered as human anatomical waste. Such waste should be handed over to the

operator of common bio-medical waste treatment and disposal facility in yellow bag with a copy of the official Medical Termination of Pregnancy certificate from the Obstetrician or the Medical Superintendent of hospital or healthcare establishment.

6. Cytotoxic drug vials shall not be handed over to unauthorised person under any circumstances. These shall be sent back to the manufactures for necessary disposal at a single point. As a second option, these may be sent for incineration at common bio-medical waste treatment and disposal facility or TSDFs or plasma pyrolysis at temperature >1200 0C.
7. Residual or discarded chemical wastes, used or discarded disinfectants and chemical sludge can be disposed at hazardous waste treatment, storage and disposal facility. In such case, the waste should be sent to hazardous waste treatment, storage and disposal facility through operator of common bio-medical waste treatment and disposal facility only.
8. On-site pre-treatment of laboratory waste, microbiological waste, blood samples and blood bags should be disinfected or sterilised as per the Guidelines of World Health Organisation or National AIDS Control Organisation and then given to the common bio-medical waste treatment and disposal facility.
9. Installation of in-house incinerator is not allowed. However in case there is no common biomedical facility nearby, the same may be installed by the occupier after taking authorisation from the State Pollution Control Board.
10. Syringes should be either mutilated or needles should be cut and or stored in tamper proof, leak proof and puncture proof containers for sharps storage. Wherever the occupier is not linked to a disposal facility it shall be the responsibility of the occupier to sterilize and dispose in the manner prescribed.
11. Bio-medical waste generated in households during healthcare activities shall be segregated as per these rules and handed over in separate bags or containers to municipal waste collectors. Urban Local Bodies shall

have tie up with the common bio-medical waste treatment and disposal facility to pickup this waste from the Material Recovery Facility (MRF) or from the house hold directly, for final disposal in the manner as prescribed in this Schedule.

7.9 Duty of Occupier in the Treatment and Disposal of Bio-Medical Waste

In addition to the above duties discussed under the segregation part, the occupier has the following duties relating to the treatment and disposal of bio-medical waste under Rule 7 of the Bio-Medical Waste Management Rules, 2016.

- Occupier shall hand over segregated waste as per the Schedule-I to common bio-medical waste treatment facility for treatment, processing and final disposal. Provided that the lab and highly infectious bio-medical waste generated shall be pre-treated by equipment like autoclave or microwave⁹⁸.
- No occupier shall establish on-site treatment and disposal facility, if a service of `common biomedical waste treatment facility is available at a distance of seventy-five kilometer⁹⁹.
- In cases where service of the common bio-medical waste treatment facility is not available, the Occupiers shall set up requisite biomedical waste treatment equipment like incinerator, autoclave or microwave, shredder prior to commencement of its operation, as per the authorisation given by the prescribed authority¹⁰⁰.
- Any person including an occupier or operator of a common bio medical waste treatment facility, intending to use new technologies for treatment of bio medical waste other than those listed in Schedule I shall request the Central Government for laying down the standards or operating parameters¹⁰¹.
- After ensuring treatment by autoclaving or microwaving followed by mutilation or shredding, whichever is applicable, the recyclables from the treated bio-medical wastes such as plastics and glass shall be given to such

⁹⁸ Rule 7 (2) of the Bio-Medical Waste Management Rules, 2016.

⁹⁹ Rule 7(3) of the Bio-Medical Waste Management Rules, 2016.

¹⁰⁰ Rule 7(4) of the Bio-Medical Waste Management Rules, 2016.

¹⁰¹ Rule 7(5) of the Bio-Medical Waste Management Rules, 2016.

recyclers having valid authorisation or registration from the respective prescribed authority¹⁰².

- The Occupier or Operator of a common bio-medical waste treatment facility shall maintain a record of recyclable wastes referred to in sub-rule (9) which are auctioned or sold and the same shall be submitted to the prescribed authority as part of its annual report. The record shall be open for inspection by the prescribed authorities¹⁰³.
- The handling and disposal of all the mercury waste and lead waste shall be in accordance with the respective rules and regulations¹⁰⁴.
- Every authorised person¹⁰⁵ shall maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal or any other form of handling of bio-medical waste, for a period of five years, in accordance with these rules and guidelines issued by the Central Government or the Central Pollution Control Board or the prescribed authority as the case may be.

7.10 Standards for Treatment and Disposal

To achieve the goal of proper treatment and disposal the Bio-Medical Waste (Management & Handling) Rules, 1998 under Schedule V prescribed certain standards to be followed by the operator of such technologies. Different standard have been enumerated under this Schedule for different treatment processes which are as under:

- **Incineration** - It is divided into operating standards and emission standards. A well designed pollution control devices should be installed with the standards provided for treatment and disposal incinerator to achieve the emission standards systems. To follow the operating standards, the Schedule prescribed for the combustion efficiency of at least 99.00%

¹⁰² Rule 7(9) of the Bio-Medical Waste Management Rules, 2016.

¹⁰³ Rule 7(10) of the Bio-Medical Waste Management Rules, 2016.

¹⁰⁴ Rule 7(11) of the Bio-Medical Waste Management Rules, 2016.

¹⁰⁵ Under Rule 3 (d) of the Bio-Medical Waste Management Rules, 2016 “athorised person” means an occupier or operator authorised by the prescribed authority to generate, collect, receive, store, transport, treat, process, dispose or handle bio-medical waste in accordance with these rules and the guidelines issued by the Central Government or the Central Pollution Control Board, as the case may be.

and the temperature of the primary chamber shall be a minimum of 800° C and secondary chamber shall be minimum of 1050° C + or – 50° C. The Schedule also prescribed the emission standards under part B. For different parameters like particulate matter, nitrogen oxide, HCL etc. different concentration (150, 451, 50 etc.) of mg/Nm³ at 12% CO₂ was prescribed. In order to follow the same certain instruction have been provided under the note such as suitably designed pollution control devices should be installed with the incinerator to achieve the above emission limits, chlorinated plastics shall not be incinerated, toxic metals in incineration ash shall be limited within the regulatory quantities etc.

- **Autoclave-** Different temperature, pressure and time limit has been prescribed. Bio-medical waste shall not be considered as properly treated through autoclaving unless the time, temperature and pressure indicators indicate that the required time, temperature pressures were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved. The Schedule also prescribed certain permissible limits for effluents generated from hospital. The autoclave machine must satisfy the validation test which is of two types: spore test and routine test. Under the spore testing, the autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit which shall be bacillus stearothermophilus spores using vials or spore strips. For the routine test, the chemical indicator strip/tape help in viewing the changes of colour when a certain temperature is reached which helped in verifying that a specific temperature has been achieved.
- **Liquid Waste** – The effluent generated from the hospital should conform to the limits as provided in the Schedule. For different parameters different permissible limits have been prescribed. These limits are applicable to those hospitals which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge

into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

- **Microwaving** – The standards of microwaving simply provides for dos and don'ts. It has to comply with the efficacy test and routine test. Along with this a performance guarantee may be provided by the suppliers before the operation of the unit. It should completely and consistently kill the bacteria and other pathogenic organisms that are ensured by approved biological indicator at the maximum design capacity of each microwave unit.
- **Deep Burial**- It also provide for dos and don'ts. A pit or trench should be dug about 2 meters deep. It must be ensured that animals do not have any access to burial sites for that covers with meshes may be used. The pit should be distant from habitation and sited so as to ensure that no contamination occurs of any surface water or ground water. The deep burial must be performed under close and dedicated supervision.

Unlike the Bio-Medical Waste (Management & Handling) Rules, 1998, the Bio-Medical Waste (Management & Handling) Rules, 2011 also prescribed similar acceptable emission standards for incinerator. But the Bio-Medical Waste Management Rules, 2016 lay down stricter standards of emission from incinerators which has been reduced to 50mg/Nm³. Similarly, the standard retention time in the secondary chamber has been increased from one second to two seconds. The secondary chamber in incineration is where the temperature is lowered to 100 or 200 degree Celsius. This is done to reduce dioxins and furans as, at low temperature, incineration of biomedical waste leads to the production of carbon dioxide and water. Regarding the existing incinerators and all upcoming incinerators, the new Rules, 2016 by imposing a duty on the occupier lay down that such incinerators shall comply with the standard for dioxins and furans within a period of two years from the date of commencement of these rules¹⁰⁶. The fuel to be used in the incineration are low sulphur fuel like light diesel oil or low sulphur heavy stock or diesel, compressed natural gas, liquefied petroleum gas etc¹⁰⁷. The similar operating standard has been provided under the new Rules, 2016 for plasma pyrolysis or gasification. The emission standard to be followed for the same is as provided in the emission standard

¹⁰⁶ Rule 4(t) of the Bio-Medical Waste Management Rules, 2016.

¹⁰⁷ Part B, Note (g) in Schedule II of the Bio-Medical Waste Management Rules, 2016.

for incinerator although under the new head 'air emission standard and air pollution control measures'. Accordingly it lay emphasis and prescribed the air emission standard for incinerator, notified at Serial No.1 above in this Schedule, and revised from time to time. It has also prescribed for the installation or retrofitted suitably designed air pollution control devices. Such waste should not be chemically treated with any chlorinated disinfectants and chlorinated plastics shall not be treated in the same system¹⁰⁸. Lastly, the ash or vitrified material generated from the Plasma Pyrolysis or Gasification shall be disposed off in accordance with the Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008.

The standards for autoclaving of bio-medical waste are divided into three parts. The first part under serial no. 1 prescribed the standard for operating a gravity flow autoclave either in a temperature of not less than 121 degree Celsius and pressure of 15 pounds per square inch for an autoclave residence time of not less than 60 minutes or a temperature of not less than 135 degree Celsius and a pressure of 31 pounds square inch for an autoclave residence time of not less than 45 minutes etc. For operating a vacuum autoclave medical waste shall be subjected to a minimum of three pre-vacuum pulse to purge the autoclave of all air. It is also subject to the temperature standard as referred in serial no. 2 of the same and serial no. 3 lay down the same option as it was there under the Bio-Medical Waste (Management & Handling) Rules, 1998 which is relating to the pressure indicators as mentioned above. The new Rules, 2016 also lay down the provisions relating to validation test, spore test and routine test. It has added a new technology to be installed in the autoclave machine for recording of operational parameters which will automatically and continuously monitor and record dates, time etc. along with load identification number the operating parameters throughout the entire length of the autoclave cycle.

For microwave and deep burial the new Rules, 2016 alongwith the same standard prescribed in the earlier Rules, 1998 some additional standard has also been prescribed. For example, Biological indicators for microwave shall be *Bacillus atrophaeus* spores using vials or spore strips with at least 1×10^4 spores per detachable strip. The biological indicator shall be placed with waste and exposed to same conditions as the waste during a normal treatment cycle. Likewise, for deep burial, an additional and important point find place in the Rule which says that the ground water

¹⁰⁸ Part B, Serial No. 2 clause (iii), Schedule II of the Bio-Medical Waste Management Rules, 2016.

table level should be a minimum of six meters below the lower level of deep burial pit. The inclusion of the clause is for the purpose of avoiding all types of risk involved in the deep burial which has a tendency of percolating the underground water.

In addition to the above said standards the new Rules, 2016 also provided with two new standards namely the standard for efficacy of chemical disinfection and for dry heat sterilisation. The use of technical terms for chemical disinfection made it difficult to follow the same standard unless trained properly. Compare to this, the standard for dry heat sterilisation is somehow easy which lay that waste sharps can be treated by dry heat sterilisation consisting of automatic recording system to monitor operating parameters at a temperature not less than 1850 C, at least for a residence period of 150 minutes in each cycle, which sterilisation period of 90 minutes¹⁰⁹.

7.11 Comparison of Treatment Technologies for Bio-Medical Wastes¹¹⁰

The following are the comparison made of various treatment technologies in order to find out the viability of such treatment technology:

Table 7

Different treatment technologies and its characteristics

Treatment Systems	Autoclave	Hydroclave	Microwave	Incinerator	Chemical
Description	Steam sterilisation (Direct heating)	Steam sterilisation, (indirect heating) simultaneous shredding and dehydration	Microwave heating of pre-shredded waste	High temperature waste incineration	Mixing pre-ground waste with chemical, such as chlorine
Sterilisation efficacy	Medium	Medium	Medium	High (total destruction of micro-organism)	Dependent on chlorine strength and dispersment through the waste
Capital Cost	Low	Low	High	High	Moderate
Operating cost	Low	Low	High	High	Low

¹⁰⁹ Standard 7, Schedule II of the Bio-Medical Waste Management Rules, 2016.

¹¹⁰ B. Ramesh Babu, A.K. Parande, *et. al.*, "Management of Biomedical Waste in India and Other Countries: A Review" Vol. 4(1) Journal of International Environmental Application & Science pg. 68 (2009).

Operator maintenance skill	Low skill level required	Low skill level required	Automated, but highly complex and high level maintenance skill required	High level operator and maintenance skills required	High level required for chemical control and grinder
Air emissions	Odorous but not-toxic	Somewhat odorous but non-toxic	Somewhat odorous but non-toxic	Can be highly toxic	Some chlorine emissions
Water emissions	Odorous, may contain live micro-organisms	Odorous but sterile	Negligible	None	None
Treated waste characteristics	Wet waste, all material recognizable	Dehydrated, shredded waste, unrecognisable material	Shredded but wet waste	Mostly ash, may contain toxic substances	Shredded wet waste, containing chemicals used as disinfectants

From the above table it is clear that the treatment and disposal technologies prescribed by the Rules have some defects. It can be said that not every treatment technologies is said to be perfect and can dispose of the bio-medical waste without leaving any harmful effect in the environment. In some technology the capital cost is high and in some other although it is low but it has some consequential effect which has effect in the degrading condition of the environment. What is required is to adopt much more advance technologies for the treatment and disposal of such waste so that the risk factor involved in such technologies could possibly be removed. Although, the new Rules, 2016 has made an attempt to overcome such difficulties by way of including further treatment options to be followed after adopting a particular treatment technology for the treatment of the bio-medical waste, it is important that the authority should keep a vigilant eyes to ensure that the provisions of the Rules are being strictly followed. For instance the operator should keep in mind that while operating the incinerator it is maintaining its optimum level and if the operator follow careless attitude the treatment of particular type of waste through incinerator would remain far away from the target and the main purpose of rooting out the problem of bio-medical waste would be at stake. In most of the surveys carried out, incinerators run at temperatures lower than those specified in the rules and due to this poor operation and maintenance, these incinerators do not destroy the waste, need a lot of

fuel to run, and are often out of order. When every hospital uses an incinerator, it is under utilised since the amount of infectious waste of a single hospital is not sufficient for the optimum use of the machine and this would lead to the improper treatment of the same. Therefore on the whole, it is not feasible for every hospital to use an incinerator and it is preferable to have centralised incinerators instead. By improving the condition of existing treatment technologies system and following of the new treatment technology under the new Rules, it would be possible to cope up with the problem of bio-medical waste in an extensive manner and if the Rule as a whole is strictly implemented than in the future there will be no bio-medical waste problem. To achieve such target the new Rules prescribed that the existing incinerators shall achieve the standards for retention time in secondary chamber and dioxin and furans within two years from the date of this notification with a view to improve the environment in the vicinity treatment facility.

7.12 Need for Common Bio-Medical Waste Treatment Facilities

The Common Bio-Medical Waste Treatment Facility (CBMWTF) is a set up that can be used to treat biomedical waste generated in a number of health care facilities to reduce the adverse effects that may arise out of this waste¹¹¹. It may have more than one treatment option, to take care of various categories of waste from different health care units. The treated waste may finally be sent for disposal in a landfill or for recycling purposes. Installation of individual treatment facilities by small healthcare facilities requires comparatively high capital investment. In addition, it requires separate manpower and infrastructure development for proper operation and maintenance of treatment systems. The concept of CBMWTF not only addresses such problems but also prevents proliferation of treatment equipment in a city. In turn it reduces the monitoring pressure on regulatory agencies. By running the treatment equipment at CBMWTF to its full capacity, the cost of treatment of per kilogram gets significantly reduced. Its considerable advantages have made CBMWTF popular and proven concept in many developed countries¹¹². Advantages of a centralised facility

¹¹¹ Government of India, Revised Draft Guidelines for Common Bio-medical Waste Treatment Facilities, Central Pollution Control Board, pg. 1 (July, 2016).

¹¹² *Ibid.*

are reduction in pollution and energy consumption, streamlined collection, and treatment of waste. This facility has been widely accepted in the developed countries.

In India, the Bio-Medical Waste (Management & Handling) Rules, 1998, gives an option to the bio-medical waste generator that such waste can also be treated at the common bio-medical waste treatment facility¹¹³. The Second Amendment of the Rules in June, 2000, further eased the bottleneck in upbringing the CBMWTF by making Local Authority responsible for providing suitable site within its jurisdiction. But no further detail had prescribed relating to the setting up of such technologies.

Owing to the growing number of pollution cases and the high cost consumption in an individual set up for the treatment and disposal of various categories of bio-medical waste, the Bio-medical Waste Management Rules, 2016 under Sub-rule 4 of Rule 7 read with Rule 3(g) has laid down rule for the setting up of CBMWTF with a view to remove such difficulties. The Rule restricts occupier for establishment of an on-site treatment and disposal facility, if a service of common bio- medical waste treatment facility is available at a distance of seventy-five kilometer¹¹⁴. In cases where service of the common bio-medical waste treatment facility is not available, the occupiers shall set up requisite biomedical waste treatment equipment as per the authorisation given by the prescribed authority¹¹⁵.

Rule 17 of the Bio-Medical Waste Management Rules, 2016 lay down the rule relating to the site for CBMWTF which says that without prejudice to rule 5 of these rules, the department in the business allocation of land assignment shall be responsible for providing suitable site for setting up of common biomedical waste treatment and disposal facility in the State Government or Union territory Administration. The selection of the site for setting up of such facility shall be made in consultation with the prescribed authority, other stakeholders and in accordance with guidelines published by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board. Based on the information published by the Central Pollution Control Board¹¹⁶ the detailed of the present bio-medical waste management scenario in the country is given below:

¹¹³ Rule 5 (2) of the Bio-Medical Waste (Management & Handling) Rules, 1998.

¹¹⁴ Rule 7(3) of the Bio-Medical Waste Management Rules, 2016.

¹¹⁵ Rule 7(4) of the Bio-Medical Waste Management Rules, 2016..

¹¹⁶ Government of India, Annual Report on Status and Issues on implementation of Bio-medical Waste (Management & Handling) Rules, 1998 and as amended, Central Pollution Control Board, Hazardous Waste Management Division, March 26, 2015.

Table 8**Annual Report of Bio-Medical Waste management scenario in India**

Particulars	As per Annual Report Information for the year 2013
No. of healthcare facilities	1,68,869
No. of beds	17,13,742
No. of Common Bio-medical Waste Treatment Facilities (CBWTFs)	198 (in operation)+28 (under installation)
No. of healthcare facilities (HCFs) using CBWTFs	1,31,837
No. of HCFs having treatment & disposal facilities	22,245
No. of healthcare facilities applied for authorization	1,06,805
No. of healthcare facilities granted authorization	1,05,270
Total no. of on-site/captive treatment equipment installed (excluding CBWTFs) by the HCFs: 1. No. of incinerators i) With Air Pollution Control Device (ii) Without Air Pollution Control Device 2. No. of autoclaves 3. No. of microwaves 4. No. of Hydroclave 5. No. of Shredders	331 217 3,112 250 15 5,179
Total no. of treatment equipment installed by the CBWTFs: 1. No. of incinerators 2. No. of autoclaves 3. No. of microwaves 4. No. of Hydroclave 5. No. of Shredders	198 189 06 03 202
Quantity of bio-medical waste generated in Tons/day	484
Quantity of bio-medical waste treated in Tons /day	447
No. of HCFs/CBWTFs violated BMW Rules	7,894
No. of Show-cause notices/Directions issued to defaulter HCFs/CBWTFs	4,391

7.12.1 Duties of the Operator of a Common Bio-Medical Waste Treatment Facility¹¹⁷

Apart from the duties of the occupier the present rules have also listed some duties liabilities on the operators of common bio-medical waste treatment facility.

They are:

1. To take all necessary steps to ensure that the bio-medical waste collected from the occupier is transported, handled, stored, treated and disposed of, without any adverse effect to the human health and the environment, in accordance with these rules and guidelines issued by the Central Government or, as the case may be, the Central Pollution Control Board from time to time.

2. To ensure timely collection of bio-medical waste from the occupier as prescribed under these rules.

3. To establish bar coding and global positioning system for handling of bio-medical waste within one year.

4. To inform the prescribed authority immediately regarding the occupiers which are not handing over the segregated bio-medical waste in accordance with these Rules.

5. To provide training for all its workers involved in handling of bio-medical waste at the time of induction and at least once a year thereafter.

6. To assist the occupier in training conducted by them for Bio-Medical Waste management.

7. To undertake appropriate medical examination at the time of induction and at least once in a year and immunise all its workers involved in handling of bio-medical waste for protection against diseases, including Hepatitis B and Tetanus, that are likely to be transmitted while handling bio-medical waste and maintain the records for the same.

8. To ensure occupational safety of all its workers involved in handling of bio-medical waste by providing appropriate and adequate personal protective equipments.

9. To report major accidents including accidents caused by fire hazards, blasts during handling of biomedical waste and the remedial action

¹¹⁷ Rule 5of the Bio-Medical Waste Management Rules, 2016.

taken and the records relevant thereto, (including nil report) in Form I to the prescribed authority and also along with the annual report.

10. To maintain a log book for each of its treatment equipment according to weight of batch; categories of waste treated; time, date and duration of treatment cycle and total hours of operation.

11. To allow occupier, who are giving waste for treatment to the operator, to see whether the treatment is carried out as per the rules.

12. Shall display details of authorisation, treatment, and annual report etc. on its web-site.

13. After ensuring treatment by autoclaving or microwaving followed by mutilation or shredding, whichever is applicable, the recyclables from the treated bio-medical wastes such as plastics and glass shall be given to recyclers having valid consent or authorisation or registration from the respective State Pollution Control Board or Pollution Control Committee.

14. Supply non-chlorinated plastic coloured bags to the occupier on chargeable basis, if required.

15. Common bio-medical waste treatment facility shall ensure collection of biomedical waste on holidays also.

16. Maintain all record for operation of incineration, hydro or autoclaving for a period of five years, and

17. Upgrade existing incinerators to achieve the standards for retention time in secondary chamber and Dioxin and Furans within two years from the date of this notification.

Besides the above duties, every occupier or operator of common bio-medical waste treatment facility shall submit an annual report to the prescribed authority in Form-IV, on or before the 30th June of every year as per Rule 13 (1) of the Bio-Medical Waste Management Rules, 2016. The Annual Reports shall also be made available online on the websites of Occupiers under Rule 13 (4).

7.12.2 Liability of the Occupier & Operator of Common Bio-Medical Waste Treatment Facility (CBMWTF)

As per Rule 18 of the Bio-Medical Waste Management Rules, 2016 the occupier or an operator of a common bio-medical waste treatment facility shall be

liable for all the damages caused to the environment or the public due to improper handling of such waste. The Rule also prescribed that the occupier or operator of CBMWTF shall be liable if they do not follow any of the direction given by the Central Government such as closure, prohibition or regulation of any industry, operation or process or stoppage or regulation of the supply of electricity or water or any other service under section 5 of the Environment Protection Act, 1986. For non-compliance of the rules, orders or directions the Act under Section 15 prescribed punishment with imprisonment for a term which may extend to five years with fine which may extend to one lakh rupees or with both. In case if violation continues, with additional fine up to five thousand rupees for every day failure or contravention after the conviction for the first such failure or contravention. A further punishment up to seven years is also prescribed if the contravention continues beyond a period of one year after such conviction. The inclusion of this Rule is to ensure that lack of carelessness on the part of occupier and operator in dealing with CBMWTF would subject them to the stringent liability. The imposition of punishment in terms of fine in case there is failure to comply with the rule and of conviction for continuous violation is an important step towards reducing the ill effect of the bio-medical waste because without strict penalty the persons responsible for the management of the waste would have a casual attitude which will make the Rule ineffective.

7.13 The Process of Authorisation and the Duties of the Prescribed Authority

Rule 10 of the new rules, 2016 lay new criteria for authorisation of the health care facility. The Rule says that every occupier generating of bio-medical waste irrespective of its quantity shall apply under Form II to the State Pollution Control Board or Pollution Control Committee as the case may be for authorisation. In the 1998 Rule, it was prescribed that hospitals with more than one thousand beds must obtain authorisation from the State Pollution Control Boards while the 2011 draft expanded the ambit of institutions that require authorisation to include all the health care facilities. The new Rules, 2016 make the procedure of getting an authorisation very simple i.e. bedded hospital will get automatic authorisation and non-bedded hospitals will get a one-time authorisation. The grant of authorisation by the prescribed authority shall at first be provisional in Form III subject to some changes in the treatment technologies if directed and after making necessary changes the

occupier shall submit a fresh application in Form II for modification of the conditions of authorization to make it final¹¹⁸.

The new Rule, 2016 further prescribed some duties on the prescribed authorities relating to the grant of authorisation. Apart from grant and renewal of licence the authorities have the duty to suspend or refuse to grant and also to cancel the authorisation if there is any violation on the part of the occupier.

7.14 Monitoring Committee

Another improvement in the new Rules is in the monitoring sector. While the 2011 rules have no provision for a monitoring authority, the 2016 rules state that the Ministry of Environment and Forest will review health care facilities once a year through State Health Secretaries, the State Pollution Control Board (SPCB) and the Central Pollution Control Board (CPCB)¹¹⁹. Whereas the CPCB shall monitor the implementation of these rules in respect of all the Armed Forces health care establishments and may also inspect such establishments along with one or more representatives of the Advisory Committee constituted under sub-rule (2) of Rule 11, the SPCB shall after constituting District Level Monitoring Committee in the districts under the chairmanship of District Collector or District Magistrate or Deputy Commissioner or Additional District Magistrate monitor the compliance of all the Rules in the health care facilities. Rule 12 (6) states the composition of the District Level Monitoring Committee and this consisted of the District Medical Officer or District Health Officer, representatives from State Pollution Control Board or Pollution Control Committee, Public Health Engineering Department, local bodies or municipal corporation, Indian Medical Association, common bio-medical waste treatment facility and registered non-governmental organisations working in the field of bio-medical waste management and the District Medical Officer shall be the Member Secretary of this Committee.

The establishment of District Level Monitoring Committee is an important step in the effective implementation of the existing bio-medical waste rule that comprises of almost all sectors those are directly or indirectly responsible or has some connection in the proper management of such wastes. The involvement of different

¹¹⁸ Rule 19 (4) of the Bio-Medical Waste Management Rules, 2016.

¹¹⁹ Rule 12 (1) of the Bio-Medical Waste Management Rules, 2016.

pollution control bodies along with the NGO's who are working on the subject is a welcome step towards eradicating the menace of bio-medical waste completely in near future. In the absence of monitoring committee earlier it was not possible to oversee whether the whole process of management of the bio-medical waste are being performed by those persons specially the occupier and operator in accordance with the existing Rules and due to the carelessness on the part of these persons responsible in handling such waste, the whole mechanisms of bio-medical waste management would be in vein. What is necessary is that the Committee should discharge the duties in compliance of the Rules in order to root out the problem relating to such waste.

7.15 An Overview

On the basis of above discussions it can be summarise that although the Rules on the Bio-Medical Waste is not new and the same has been subject to amendment thrice between 1998-2011, still it suffered with lacunaes which necessitated the passing of new Rules in the year 2016 to overcome the problems for proper and effective management of it. A throwback to the existing scenario showed the tremendous rise of the problem in the country which could not be handled under the previous Rules and the outcome is the passing of the new Rules in this connection. What is to be seen is that despite few drawbacks in the present Rules whether the Bio-Medical Waste problem could possibly be properly controlled and managed or more stringent Rules is required for the same or the problem lies somewhere which could not be properly identified. This gives rise to the need of empirical research on the subject to find out the exact problem relating to the Bio-Medical Waste so that appropriate and effective measures could be adopted to fight with it.

CHAPTER VIII

BIO-MEDICAL WASTE DISPOSAL SCENARIO IN USA, UK AND CHINA UNDER THE RESPECTIVE LEGAL FRAMEWORK

The issues concerning the ill effect of the Bio-Medical Waste and its impact on the environment has been of recent development in the international field and the outcome is the enactment of various laws by the countries of the world, the root of which could be found in the Stockholm Conference, a milestone towards combating different environmental issues including the Bio-Medical Waste. Being the new subject in the field of environment, in no such Conventions and Conferences held during the past, the key issue was on the bio-medical waste. The Basel Convention held in 1989 had for the first time highlighted on the importance of managing various types of wastes which also includes the waste arising from hospital industries. But no such drastic steps were accorded to meet the challenge; eventually the conferences helped the countries to consider the issue seriously in near future. It is reported that for the first time the bio-medical waste issue was discussed at a meeting convened by the World Health Organisation (WHO) Regional Office for Europe at Bergen, Norway in the year 1983¹. With the passage of time, the problem has evolved as a global humanitarian issue and there came into existence various types of regulatory laws in different parts of the world including India to manage and control the same in their own way and thereby would help the countries in adopting proper steps towards complete eradication of the problem relating to the waste. The question that arises is whether the existing law of the respective countries is comprehensive within the framework of which such problem could properly be handled or the insufficiency in the laws without making major amendments would leave the question unanswered as to where we are pushing ourselves whether it is in such a world where “cleanliness is next to the Godliness” or in a world of dumping ground, where the very existence of the human being in such a world is becoming next to impossible? Another pertinent question is how to judge an existing law incomplete where the social standard varies

¹ A. Sreejith, “Hygiene and Bio-Medical Waste Management plan for healthcare environmental setting: A study with special focus on Kerala, India” pg. 9 (2008), *Available at:* <https://www.scribd.com/doc/8107661/Bio-Medical-Waste-Management-Hygiene-in-Healthcare-Environment> (Last visited on Dec. 2, 2016).

from countries to countries and it is difficult to adopt a uniform measure worldwide due to higher cost of the equipments that are being use to dispose of such waste? Therefore, in search of the above mentioned quests, it is important to focus on the existing laws of different country relating to the subject in order to reach to a conclusion as to whether the existing law of India is self sufficient or some major changes is required to meet and handle the problem properly and effectively. The present Chapter examines the laws on bio-medical waste of few developed countries who, to some extent are successful in tackling the ill effect of such waste on environment. The analysis of the laws of different countries would not only help the researcher to find out major defects in our laws, it would also help in finding out the measures the adoption of which would help in sorting out the problem to a large extent.

8. Bio-Medical Wastes (BMW) Management in the Developed Countries

Few countries of the world have specific legislation to deal with the management and handling of bio-medical waste. The study has revealed information about the legal mechanisms prevalent in the United States of America, United Kingdom, Australia, South Africa, Europe, Asian and South Asian countries, all of which have legislative enactments of different types to deal with bio-medical waste management. Some of such laws of some of these countries have been discussed herein below.

8.1 The United States of America (USA)

The recent hue and cry relating to the problem of BMW in America could be understood from numerous incidents taken places in the recent past that can be referred to in order to understand the BMW scenario in the country. The first of such incident took place in a New York City in 1986 where one thousand four hundred bags of medical waste were dumped illegally. Surprisingly, it was reported that the same had been incinerated. Again, in June 1987, twelve children from Indianapolis, Indiana were found playing with vials of blood outside a health medical office. After testing the same it was found that two of the vials were infected with the AIDS virus. It is interesting to note that at that time it was completely valid for these types of waste to be disposed of in an open dumpster. And in 1988, a New Jersey garbage slick

a mile long, composed of syringes and empty prescription bottles with New York addresses, was the first of many medical waste wash-ups on beaches along the east coast from Maine to Florida, the west coast, the Great Lakes, and the Gulf Coast. These beaches were temporarily closed². To add, it is to be noted that the discharge of a pollutant into the navigable waters of the United States is prohibited unless compliance is achieved under the provisions of the Clean Water Act (CWA)³. This incident not only closed many of the beautiful beaches along the coast but, more shockingly, instilled a great public fear of a new health hazard. Although illegal dumping of medical waste appears to pose no serious threat to our beaches, the 1987 beach scare showed the public that without proper regulations, medical waste could be dumped in anyone's backyard⁴. It is ironical that despite the recent publicity and outrage over the medical waste issue, the 1988 beach wash-ups were less of a medical waste disposal problem than the public was led to believe. Only 0.1% of the total debris collected in 1988 from the coastal states was plastic syringes, with a total of 1% constituting general medical waste⁵. Out of the total BMW generated in hospitals in USA, most of them are solid waste and infectious medical waste constitutes only ten to fifteen percent. Despite less in percentage, in 1988, the federal Center for Disease Control determined that at least 18,000 people annually contract hepatitis-B through accidental exposure to medical waste involving infectious waste. Each year up to 200 to 300 health care workers die from hepatitis-B⁶. The table below shows the detail of total healthcare waste and infectious waste generated in the USA.

² Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol. 14 Northwestern Journal of International Law & Business pg. 206 (1993).

³ Ann M. Babigian, "Medical Waste, a Loaded Gun on the Verge of Firing" Vol. 13 Pace Environmental Law Review pgs.1063-64 (1996).

⁴ Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 Fordham Environment Law Review pg.103 (2011).

⁵ Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol.14 Northwestern Journal of International Law & Business pg. 206 (1993).

⁶ Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 Fordham Environment Law Review pg.105 (2011).

Table 1

Total healthcare and infectious waste generation by type of health-care facility: high-income country (United States of America)⁷

Type of healthcare facility	Total healthcare waste generation	Infectious waste generation
Metropolitan general hospitals	10.7 kg/occupied bed/day	2.79 kg/occupied bed/day
Rural general hospitals	6.40 kg/occupied bed/day	2.03 kg/occupied bed/day
Psychiatric and other hospitals	1.83 kg/occupied bed/day	0.043 kg/occupied bed/day
Nursing homes	0.90kg/occupied/day	0.038 kg/occupied bed/day
Laboratories	7.7 kg/day	1.9 kg/day
Doctor's office (group practice, urban)	1.78 kg/physician-day	0.67 kg/physician-day
Doctor's office (individual, urban)	1.98 kg/physician-day	0.23 kg/physician-day
Doctor's office (rural)	0.93 kg/physician-day	0.077 kg/physician-day
Dentist's office (group practice)	1.75 kg/dentist-day	0.13 kg/dentist-day
Dentist's office (individual)	1.10 kg/dentist-day	0.17 kg/dentist-day
Dentist's office (rural)	1.69 kg/dentist-day	0.12 kg/dentist-day
Veterinarian (group practice, metropolitan)	4.5 kg/veterinarian-day	0.66 kg/veterinarian-day
Veterinarian (individual, metropolitan)	0.65 kg/veterinarian-day	0.097 kg/veterinarian-day
Veterinarian (rural)	7.7 kg/veterinarian-day	1.9 kg/veterinarian-day

Under the above circumstances, there is an urgent need to focus on various laws, regulations, guidelines etc. in existence in the country relating to the BMW that aimed in reducing such waste to the minimum. The knowledge of such laws etc. would help in understanding the subject in a far better way on the basis of which proper steps could be suggested to tackle the same in our country. An analysis of the various laws, regulations is made here in below to achieve such purposes.

⁷ Yves Chartier, *et. al.*, "Safe management of wastes from health-care activities" World Health Organisation, pg. 3 (2nd Edn., 2014).

8.1.1 Medical Waste Tracking Act, 1988 (MWTA)

Medical waste was first formally recognised as a distinct waste stream by a federal agency in 1978 when the Environmental Protection Agency (EPA) considered classifying infectious waste as hazardous waste under the Resource Conservation Recovery Act (RCRA), 1976⁸. In fact, when EPA first proposed hazardous waste regulation, infectious wastes were included in it. However, in 1979, the agency determined that infectious wastes did not pose a significant health threat, and when EPA promulgated its RCRA hazardous waste regulations in 1980, it chose not to classify infectious waste as hazardous. However, EPA decided to treat medical waste as solid waste and the agency never issued the proposed regulations⁹.

To quell the public's fear of improper medical waste disposal, Congress hastily enacted a two-year demonstration program - The Medical Waste Tracking Act (MWTA) in 1988 by way of amending RCRA adding subtitle J. The MWTA expired in June 1991. It also added a demonstration programme to RCRA, and EPA promulgated implementing regulations¹⁰. The Act was implemented in New York, New Jersey, Connecticut and Rhode Island and states bordering the Great Lakes¹¹.

The purposes of MWTA were:

- to provide a system to track medical waste to its disposal.
- to provide a system to assure generators that waste is ultimately received by the proper disposal facility and
- to provide a standard form of tracking waste within the applicable states¹².

The four main features¹³ of the Act are:

- a definition of medical waste,
- a tracking system similar to that for hazardous wastes,

⁸ Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 521 (1994).

⁹ *Ibid* at pg. 526.

¹⁰ *Ibid* at pg. 522.

¹¹ Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol. 14 Northwestern Journal of International Law & Business pg. 215 (1993).

¹² *Ibid*.

¹³ Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 544 (1994).

- information gathering power and requirements and
- enforcement capability.

8.1.1.1 Definition of Medical Waste

The MWTA defined medical waste¹⁴ as cultures and stocks of infectious agents, pathological wastes, waste human blood and products of blood, used sharps, contaminated animal carcasses, body parts and bedding of animals that were exposed to infectious agents, wastes from surgery or autopsy that were in contact with infectious agents, laboratory wastes that were in contact with infectious agents, dialysis wastes, discarded medical equipment previously in contact with infectious agents, biological waste and discarded materials contaminated by humans or animals isolated to protect others from communicable diseases, and any other waste that the Administrator believed posed a threat to human health or the environment¹⁵.

The Act laid down that the tracking of Bio-Medical Waste should be made following the cradle to grave method which involved generation to disposal of such waste in a systematic manner. For this purpose the generators, handlers, transporters etc. were required to fill out forms which allowed the Environment Protection Agency to monitor Bio-Medical Waste irrespective of large or small generators unless exempted¹⁶. The Act also provided that all generators had to segregate Bio-Medical Waste into sharps, fluids, and other waste and to be stored into the specific containers as part of the packaging requirements. Such containers must fulfil the criteria as provided in the Act which included that it must be rigid, leak-resistant, impervious to moisture, strong enough to prevent tearing or bursting under normal conditions of use and handling, and sealed to prevent leakage and to be protected from water, rain and wind and if it was stored outdoors the waste had to be locked to prevent unauthorised access by humans or animals¹⁷.

Finally, the generators had to label untreated regulated medical waste as either “medical waste” or “infectious” or display the universal biohazard symbol before transport. In addition, the generator had to mark the packages with its name, its state

¹⁴ Section 6992 of the Medical Waste Tracking Act, 1988, USA.

¹⁵ Wendy Stynes, “Safeguarding Our Health: Developments in the Management of Medical Waste” Vol. 4 Fordham Environment Law Review pg.107 (2011).

¹⁶*Ibid* at pg. 109.

¹⁷*Ibid*.

permit or identification number, the transporter's name, the transporter's state permit or identification number, the date of shipment, and identify the contents as medical waste. Furthermore, inner containers had to display the generator's name and state permit or identification number¹⁸.

8.1.1.2 Enforcement Machinery

The establishment of enforcement machinery under the enforcement scheme was an important step and was modelled on the Solid Waste Disposal Act (SWDA). It authorised Environment Protection Agency employees to enter into the generator, storage, treatment, transportation and disposal site at reasonable times to inspect the premises and obtain samples of medical waste. If the Administrator discovered a violation he could have imposed a civil penalty which could not have exceeded \$ 25,000 per day of non-compliance or brought a civil suit in the United States District Court. The potential for such high fines communicated that it was more expensive to pollute than to legally dispose of the medical waste¹⁹.

Anyone, who violated the requirements of the Act by knowingly omitting material information or made false statement or representations could be subject to criminal penalties, apart from the civil liability by the imposition of fine amounting to not more than \$50,000 for each day of violation, or imprisonment not to exceed two years. In addition, any person who knowingly committed the above mentioned violations and knew that at that time he was placing another person in imminent danger of death or serious bodily injury upon conviction would have been subject to a fine of up to \$250,000 or imprisonment for a maximum of fifteen years, or both. An organisation convicted under the MWTAA could have been subjected to a fine of not more than \$1,000,000²⁰.

The Act also imposed a high cost for the transportation and disposal of Bio-Medical Waste without any measureable benefits. For example, in order for a New York hospital to comply with MWTAA, the amount of waste that became regulated under the Act increased by 315% between 1984 and 1989, and its total costs went up

¹⁸ *Ibid.*

¹⁹ *Ibid.*

²⁰ *Ibid* at pg. 110.

nearly 700%. This dramatic increase is largely due to the huge cost differential between disposing of non-regulated medical waste and regulated medical waste²¹.

In spite of its perceived shortcomings, the MWTA has produced beneficial effects. It has contributed to our knowledge of the medical waste stream and will help identify new areas of concern. The program could help in the formulation of a uniform definition of medical waste. In addition, enforcement, inspection and tracking systems could serve as a future model, even if Congress decides medical waste should be left wholly within state purview²².

8.1.2 The Clear Air Act, 1990

This Clear Air Act is important from the disposal point of view because high percentage of the Bio-Medical Waste is incinerated in USA following different incineration mechanisms. Historically, incineration was the only method of treatment accepted by regulators for infectious waste because it offers total destruction, providing an aesthetic benefit and reducing solid waste disposal cost²³. Although incineration accounts for more than 75 percent of the total medical waste treated, while most of the remaining medical waste is autoclaved,²⁴ it is subject to some disadvantages. For example, dioxin and furan emissions are of particular concern during the incineration process. Furthermore, ash, an incineration by-product, contains hazardous substances, and it is frequently disposed of under open conditions in landfills. As under RCRA, there have been several bills introduced in recent months to address the need for a regulatory program for air emissions from medical waste incinerators²⁵. The Clean Air Act Amendments of 1990 specifically address solid waste combustion, and because medical waste is currently considered solid waste, it is covered by the statute. Section 129 of the Clean Air Act Amendments of 1990 requires Environment Protection Agency to develop New Source Performance Standards (NSPS) and Emission Guidelines (EGs) for four classes of solid waste

²¹ *Ibid.*

²² Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 551 (1994).

²³ *Ibid* at pg. 559.

²⁴ *Ibid* at pg. 561.

²⁵ Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol. 14 Northwestern Journal of International Law & Business pg. 217 (1993).

incineration units: municipal waste combustors, medical waste incinerators, industrial and commercial waste incinerators and categories of other solid waste incinerators²⁶.

The Section provides that, Environment Protection Agency must establish numerical limits for emissions of acid gases (sulfur dioxide and hydrogen chloride), particulate matter, opacity, metals (cadmium, lead, and mercury), organics (dioxins/furans), carbon monoxide, and nitrogen oxides from solid waste incineration units. The NSPS and EGs for other types of incinerators, including medical waste incinerators, are to be developed under separate rulemaking actions.

8.1.3 The Clean Water Act (CWA), 1992 and the Marine Protection, Research and Sanctuaries Act (MPRSA) 1992

Enacted during the same year, both the Acts are confined to the matter regulating the discharge and disposal of the Bio-Medical Waste. The Acts have been aimed at protecting not only surface water from degradation from improper medical waste disposal, but they may also prevent beach wash-ups and closings, which are occurring with more frequency²⁷. The CWA makes it an offence for any person to discharge a pollutant into navigable waters from ‘a point source’²⁸.

Popularly known as the Ocean Dumping Act or the Ocean Dumping Ban Act, the purpose of the MPRSA is “to regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems or economic potentialities.”²⁹ Medical waste is specifically addressed under the MPRSA and is discreetly defined³⁰. The Act

²⁶ Laura Carlan Battle, “Regulation of Medical Waste in the United States” Vol.11 Pace Environmental Law Review pg. 562 (1994).

²⁷ *Ibid* at pg. 554.

²⁸ ‘A point source’ is defined in § 1362(14) as “any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged”.

²⁹ Laura Carlan Battle, “Regulation of Medical Waste in the United States” Vol.11 Pace Environmental Law Review pg. 557 (1994).

³⁰ According to the Marine Protection, Research and Sanctuaries Act, 1992, medical waste includes isolation wastes, infectious agents, human blood and blood products, pathological wastes, sharps, body parts, contaminated bedding, surgical wastes and potentially contaminated laboratory wastes, dialysis wastes and additional items prescribed by regulation.

prohibits ocean dumping of medical waste, radiological, chemical, and biological warfare agents, and radioactive waste.

For each violation, civil penalties of up to \$50,000 can be assessed for violating the Act, its implementing regulations, or a permit. In addition, any person who violates the Act by “engaging in activity involving the dumping of medical waste” is liable for a civil penalty of up to \$125,000 for each violation. A knowing violation can result in criminal penalties of up to \$50,000 or imprisonment for one year, or both, and knowingly engaging in activity involving dumping medical waste into ocean waters can result in a \$250,000 fine or imprisonment for up to 5 years, or both³¹.

8.2 Federal Regulations

Federal regulations are specific details directives or requirements with the force of law enacted by the federal agencies necessary to enforce the legislative acts passed by Congress³². The following are the examples of the Federal Regulations including the Clean Air Act as discussed above.

8.2.1 Occupational Safety and Health Administration (OSHA) Acts, 1970 and Regulations

The Act was passed for ensuring safe and healthy working conditions of those workers working in the USA. The principal function of the OSHA is to promulgate and enforce workplace safety and health standards of the workers. The Act also provides for the enforcement of standards developed under the Act and to assist and encourage the States in their efforts to assure safe and healthful working conditions among others which deserve special mention. Under the OSHA, the Secretary of Labour has express power to regulate the handling and disposal of medical waste and to promulgate standards necessary to assure the “attainment of the highest degree of health and safety protection of the employee.”³³

³¹ Laura Carlan Battle, “Regulation of Medical Waste in the United States” Vol.11 Pace Environmental Law Review pgs. 558-559 (1994).

³² Robert Longley, Federal Regulations, The Laws Behind the Acts of Congress, (Nov. 26, 2016).

³³Christina Luise Martini, “Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform” Vol. 14 Northwestern Journal of International Law & Business pg. 218 (1993).

There are generally four OSHA standards which address infectious waste issues in the workplace³⁴. OSHA predicted that implementation of the standard could prevent approximately 200 deaths and 9,200 bloodborne infections per year. Therefore, hospitals tend to be the institutions most frequently subject to its standards³⁵. The first of such standard is OSHA's Emergency Response Standard which requires every employer to supply employees with information on proper actions during an emergency, where emergency equipment is located, how to use it and a location outside of the building where employees will meet after evacuating. Secondly, OSHA's Hazard Communication Standard requires employers to develop a written program which lists all hazardous chemicals used in the medical facility, their physical and chemical ingredients, where they are used, the type of hazard associated with their use, and other related information including the name, address and telephone number of a responsible party who can provide information and emergency procedures for the hazardous chemical. Thirdly, OSHA's Chemical Hygiene Standard requires employers to establish written policies for procedures, equipment, personal protective equipment and work practices which will effectively protect employees from hazardous chemicals in their facilities and finally, promulgation of a bloodborne Pathogen Rule requiring employers to protect workers from exposure to bloodborne pathogens. The Standard on Occupational Exposure to bloodborne pathogens, effective as of March 6, 1992, is the first set of rules that OSHA has issued in the health care industry. The regulations cover an estimated 4.9 million health care workers and 700,000 Americans who routinely handle blood or bodily fluids on the job³⁶. The regulations deal only with the handling of medical waste; they do not mandate any procedures regarding medical waste treatment or disposal. The purpose of the Standard is to reduce the chance of workers contracting disease because of exposure to medical waste.

³⁴ Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pgs. 571-572 (1994).

³⁵ Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 Fordham Environment Law Review pg. 119 (2011).

³⁶ *Ibid* at pg. 118.

8.3 Guidelines

Guidelines are ready reference tool for medical waste management. It attempted specifically to answer the day-to-day questions for the management of such waste which would help in protecting public as well as the environment from injury due to the spread of infection. It acts as a guide to state regulations or act as guidance as to what a hospital must do in order to meet the circumstance. The following guidelines are important from the BMW point of view.

8.3.1 The Environment Protection Agency (EPA) Guidelines

Since the expiration of the MWTAA, this Environment Protection Agency guide represents the agency's current perspective on acceptable infectious waste management practices. It addresses infectious waste characterisation, infectious waste management, treatment of infectious wastes, and recommendations for development of an infectious waste management plan. It is designed to guide those persons responsible for managing infectious waste at facilities such as hospitals, laboratories, animal experimentation units, industrial plants, biotechnology companies, and others which generate infectious wastes³⁷.

One of the most significant aspects of the guide is Environment Protection Agencies definition of infectious waste as waste capable of producing an infectious disease, taking into account four factors:

- presence of a pathogen of sufficient virulence,
- dose,
- portal of entry, and
- resistance of the host.

The definition provided in the guidelines has been adopted by many states and agencies regulating medical waste; however, it is nonbinding at the federal level³⁸. The guide has been criticised on two grounds. First, because EPA was uncertain of the health risks posed by infectious wastes, it failed to set forth a minimum national

³⁷Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 579 (1994).

³⁸ *Ibid.*

standard for the management and disposal of infectious waste. Secondly, the guide technically satisfies RCRA's objective of providing information, but it may have added to the confusion surrounding the risk associated with infectious waste by not providing a basis for interstate control.

8.3.2 Center for Disease Control (CDC) Guidelines

The CDC is a federal public health agency charged with the surveillance and investigation of infectious diseases in hospitals. It collects weekly, monthly and yearly statistics on many infectious diseases and on control programs for health care facilities. The Agency also makes recommendations necessary for disease control. The 1987 "Recommendations" suggested that "universal precautions" relating to blood and body fluid be consistently used for all patients regardless of their blood borne infection³⁹. These "precautions" apply primarily to health care workers and medical institutions; consequently, the guidelines reach the generators of infectious waste and their on-site handling and treatment, and have not had as much impact as the EPA guidelines on medical waste removal and disposal.

The CDC found that annually over 2,100 workers contract hepatitis-B, between 400-440 of those infected require hospitalisation, and approximately 200 die⁴⁰. The CDC focuses its energies on medical institutions and generators of infectious waste. The guideline envisages the urgency of correct labeling of infection waste which is classified on the basis of the risk of disease transmission. It also highlighted that human health and environmental safety depends on the regulation of the infectious waste because of the risk factors involved in it. Due to the lack of uniform federal regulation, many states have taken it upon themselves to promulgate their own legislation for intra-state waste disposal.

Therefore, it can be said that the steps which has been undertaken is an earnest attempt to meet the medical waste issues, there are variations in the regulations because each state addresses its own particular needs through its own legislative process. However, it has been seen that not enough time is found to perform the necessary analysis before the standards are adopted, and the necessity of such

³⁹ *Ibid* at pg. 580.

⁴⁰ Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 Fordham Environment Law Review pg. 119 (2011).

regulation is often left undisputed. Furthermore, some states regulate on the basis of listed generators versus types of waste generated, which can lead to high requirement differentials between states and regulation targeted at inappropriate sources. Moreover, stricter regulations in one state may encourage the shipment of waste to other states with less stringent regulations. This is another reason why a national standard which establishes a regulatory baseline is favorable that would help in reducing transportation costs⁴¹.

8.4 Bio-Medical Waste Management in New York State and City: Current Scenario

“Waste is not an inevitable result of production, but rather a measure of its inefficiency.” Joseph Romm, an American author and physicist⁴².

Medical waste and its proper disposal remain a major concern for America. The amount of medical waste generated increases every year as medical technology improves and as the population grows older. In 2010, an estimated 5.9 million tonne of waste were produced in hospitals in USA. More recent estimates place the number at 6,600 pounds of waste per day or 2.4 million tons per year⁴³. Every day 33 pounds of medical waste generated per staffed bed in such hospitals. It is estimated that Florida alone has approximately 38,000 facilities that generated biomedical waste⁴⁴. In 2012, the United States spent up to \$2.5 billion for the proper disposal of medical waste. Moreover, with annual growth of 4.8%, by 2017 the annual market is expected to \$3.2 billion⁴⁵.

The existing scenario of the New York City is no better. Consisted a population of 8,550,405, the city is the most populous in the United States. The city is different from the New York State and the premier gateway for legal immigration to the United States. The New York City Metropolitan Area is one of the most populous

⁴¹Christina Luise Martini, “Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform” Vol. 14 Northwestern Journal of International Law & Business pgs. 218-219 (1993).

⁴²Ryan M. Kania and Jordan B. Markel, “An Approach to Mitigating Excess Medical Waste” (December, 2010), *Available at:* <http://honors.usf.edu/documents/thesis/u91904693.pdf> (Last visited on Dec. 26, 2016).

⁴³*Ibid.*

⁴⁴Intan Airlina, “Medical Waste Disposal: The Definitive Guide,” *Available at:* <http://www.biomedicalwastesolutions.com/medical-waste-disposal/> (Last visited on Dec. 28, 2016).

⁴⁵*Ibid.*

urban agglomerations in the world. New York City is a global city, exerting a significant impact upon commerce, finance, media, art, fashion, research, technology, education, and entertainment, its fast pace defining the term New York minute⁴⁶. New York State has provided regulatory oversight of Regulated Medical Waste (RMW) since the early 1980s and has adopted a comprehensive regulatory framework covering all aspects of handling, storage, treatment and disposal of the regulated medical waste. Title 15 of Article 27 of the Environmental Conservation Law, 6 New York Codes, Rules and Regulations (NYCRR) Sub-parts 360-10 and 360-17, and Part 364 regulations, in conjunction with the Public Health Law 1389 aa-gg and 10 NYCRR Part 70 govern the activities of the New York State regulated community to properly manage RMW⁴⁷. The New York statutory and regulatory programs that control all or some of the aspects of the generation, transportation, treatment and disposal of medical waste were originally modeled after the now-defunct federal Medical Waste Tracking Act. There are two principal regulators of the treatment and disposal of medical waste in New York. The New York State Department of Environmental Conservation regulates the transportation, storage, treatment and disposal of medical waste and sets performance standards for medical waste incinerators. The New York State Department of Health regulates the storage, treatment and disposal of medical waste which takes place on-site at facilities licensed. These new regulations set in motion a process to ensure regulated parties continue to upgrade their regulated medical waste practices.

The only federal rules related to regulated medical waste are concerned with packaging for RMW interstate transport (U.S. Department of Transportation Regulations) and handling of blood borne pathogens (Occupational Safety and Health Administration Regulations) in occupational settings. In addition, other federal laws e.g., the Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act; and, the Clean Air Act and regulations e.g., U.S. Postal Service; Food and Drug Administration; U.S. Department of

⁴⁶ Department of City Planning, New York City Population, Population Facts, New York City Planning, *Available at:* <https://www1.nyc.gov/site/planning/data-maps/nyc-population/population-facts.page> (Last visited on Dec. 31, 2016).

⁴⁷New York State, Department of Environmental Conservation, "Regulated Medical Waste", *Available at:* <http://www.dec.ny.gov/chemical/8789.html> (Last visited on Jan.2, 2017).

Agriculture; and, U.S. Public Health Service govern the handling, transport and disposal of certain components of regulated medical waste⁴⁸.

There are approximately 36,000 generators of RMW and 250,000 tons of RMW generated each year in New York State. One third of this volume is attributed to healthcare facilities such as nursing homes, hospitals, and clinical laboratories, while the other two thirds is generated by physician offices, blood establishments, colleges and universities, veterinarian and dental offices, funeral homes, research laboratories, pharmaceutical and biotechnology facilities⁴⁹.

The Department of Health has undertaken a separate programme on improperly disposition of hypodermic needles and syringes which involve the risks of injury due to accidental needlesticks which results in the transmission of bloodborne infections, including hepatitis B and C, and human immune deficiency virus. In the USA at present an estimated three billion syringes are used annually for self-administration of medications and illicit drugs⁵⁰. Under the programme the Department has offered technical assistance, distributed educational materials, and created Web-based resources to foster development of community-based collection sites. To expand syringe collection by pharmacies, “Guidelines for Pharmacies Interested in Accepting Sharps for Safe Disposal” offered advice on navigation of legal and regulatory requirements pertaining to the collection of used syringes. As of January 2007, there were 1,023 syringe collection sites, of which 245 (23.9%) were hospitals, 653 (63.8%) were nursing homes, 46 (3.6%) were other health-care facilities, and the remaining 79 (7.7%) were community-based collection sites⁵¹. In clinical chemistry laboratories, data from seventy New York hospitals listed needle puncture (103 cases), acid or alkali spills (46), glass cuts (44), splash in eye (19), and bruises and cuts (45) as the most frequent exposures (21). Needle puncture, glass cuts,

⁴⁸ *Ibid.*

⁴⁹ *Ibid.*

⁵⁰ Susan J. Klein *et. al.*, “Increasing Safe Syringe Collection Sites in New York State” Public Health Report, pg. 123 (Jul-Aug, 2008), Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC2430639/ (Last visited on Jan. 2, 2017).

⁵¹ *Ibid.*

splash in eye, and bruises and cuts have the highest potential for infection from microbes⁵².

To make effective management of bio-medical waste steps have been undertaken by various hospitals in New York City to use new technological disposal methods that is eco-friendly and cost effective. Lincoln hospital is the only hospital in the city that has pioneered innovative eco-friendly and cost effective systems to safely dispose of bio-medical waste. The use of rotating autoclave technology to sterilise and grind up regulated medical waste on-site, protecting healthcare employees, other field professionals and the public as well as safeguarding the environment is an important steps in this connection. Utilising this state-of-the-art rotating autoclave machine, regulated medical waste such as sharps and other bio-hazardous material is sterilised, ground into confetti-like particles and disposed off as treated medical waste, in accordance with New York State guidelines. The autoclave machine reduces the volume of medical waste by about 80 percent and led to a savings in the treatment and removal of medical waste of \$42,000 from April 2010 to June 2010. The hospital projects it will save \$167,000 a year in the treatment and removal of medical waste⁵³.

Disposal occurs off-site, at a location that is different from the site of generation. Treatment may occur on-site or off-site. On-site treatment of large quantities of biomedical waste usually requires the use of relatively expensive equipment, and is generally only cost effective for very large hospitals and major universities who have the space, labor and budget to operate such equipment. Off-site treatment and disposal involves hiring of a biomedical waste disposal service (also called a truck service) whose employees are trained to collect and haul away biomedical waste in special containers (usually cardboard boxes, or reusable plastic bins) for treatment at a facility designed to handle biomedical waste⁵⁴.

⁵² J. Michael Miller *et. al.*, “Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories Recommendations of a CDC-convened, Bio-safety Blue Ribbon Panel” *Morbidity and Mortality Weekly Report* pg. 61 (Jan. 6, 2012).

⁵³ Nydia Negron, “Lincoln Hospital pioneers innovative eco-friendly and cost-effective system to safely dispose of medical waste”, Lincoln, New York City Health and Hospitals Corporation, (Dec. 10, 2010).

⁵⁴ *Ibid.*

8.2 United Kingdom (UK)

In the UK, the primary aim in the management of waste, like any other country, is to ensure that it is handled, treated and disposed of safely, cost effectively and in a manner that does not impact negatively on the environment. The management of healthcare waste, previously known as clinical waste is an essential part of ensuring that healthcare activities do not pose a risk or have potential risk of infection and are securely managed. England and Wales, Scotland and Northern Ireland have their own sets of laws and regulations which differ from each other. The name of the regulatory instrument is often the same (or similar), although the date when it came into force may vary⁵⁵. According to the Department of Health guidance, the Safe Management of Healthcare Waste⁵⁶, healthcare waste are “any waste produced by, and as a consequence of, healthcare activities” and also covers offensive/hygiene and infectious waste produced in the community from non-NHS (National Health Service).

8.5.1 The Regulatory Framework

The Controlled Waste Regulations 1992 (issued under the Environmental Protection Act and in Northern Ireland by the Waste and Contaminated Land (Northern Ireland) Order has defined ‘clinical waste’ as:

- (a) “. . . any waste which consists wholly or partly of human or animal tissue, blood or other bodily fluids, excretions, drugs or other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous to any person coming into contact with it; and
- (b) Any other waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar practice, investigation, treatment, care, teaching

⁵⁵Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg.8 (2013), *Available at:* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf (Last visited on Jan. 7, 2017).

⁵⁶Government of United Kingdom, Safe Management of Healthcare Waste, Department of Health (2006), *Available at:* <http://www.nhsemployers.org/~media/Employers/Publications/Safe%20management%20of%20health%20care%20waste.pdf> (Last visited on Jan. 10, 2017).

or research, or the collection of blood for transfusion, being waste which may cause infection to any person coming into contact with it.”

The definition is wide enough for all practical purposes as it covers along with the clinical waste, activities such as ear piercing, tattooing, and practice of alternative medicines, funeral undertaking as well as animal care. Clinical waste can now be dealt with in a number of different ways under the provision of the Regulations. Clinical waste from a private dwelling or residential home is household waste and as such a local collection authority has a duty to collect it if requested to do so⁵⁷.

In UK, clinical waste is broadly classified as “infectious” (identified as a new hazards group H9⁵⁸) in the Hazardous Wastes Regulations and “medical waste” in order to concentrate on proper handling and disposal of such wastes. The waste legislations enacted for the purpose of controlling the unscientific handling, collection and disposal of clinical waste is very extensive. The Regulations apply to any person or organisation that produces clinical waste. The Regulation contained provision to make the producer responsible for want of care of clinical waste. The producer is also to ensure that all the regulations relating to waste disposal are properly and effectively followed and for the same detail, accurate description of the waste need to be maintained which would help in the safe handling, treatment and disposal of such waste.

Following the implementation of the Hazardous Waste (England and Wales) Regulations 2005, certain types of waste, previously defined as clinical waste Groups A to E are now defined as hazardous waste. Some is hazardous due to its hazardous properties, such as Cytotoxic and Cytostatic Drugs, and some is classified as hazardous according to its potential infection risk and where it was produced⁵⁹.

The term “hazardous waste” used in England, Wales and Northern Ireland to describe waste with hazardous characteristics in the line with the List of Waste

⁵⁷ R. G. Kensett, *The Changing Scene of Health Care and Technology* pg. 317 (Taylor & Francis e-library, London, 1st Edn. 1990).

⁵⁸ Katherine Angel, “The Precautions of Clinical Waste: Disposable Medical Sharps in the United Kingdom” Vol. 4 Bio Societies, The University of Warwick pg. 190 (2009).,

⁵⁹ Safe Management of Healthcare Waste, A Guide to Good Practice in Secondary Care (England and Wales) January 2008, PHS Waste Management, *Available at:* <http://www.phswastemanagement.co.uk/Files/Healthcare%20Guidance.pdf> (Last visited on Feb. 21,2017).

Regulations, which transpose the European Waste Catalogue (EWC) into domestic legislation and provide codes for all hazardous and non-hazardous wastes. In Scotland it is termed as “special waste” in line with the Special Waste Amendment (Scotland) Regulations which implement the requirement of the Hazardous Waste Directive in Scotland⁶⁰. It has been identified as new hazardous property “H13 Sensitising”, renumbered as H15 and defined it as “substances and preparations which, if they are inhaled or if they penetrate the skin, are capable of eliciting a reaction of hypersensitisation such that on further exposure to the substance or preparation, characteristic adverse effects are produced”⁶¹.

Taking into account the various definitions relating to the healthcare waste it is important to have a detailed idea regarding various laws and regulations to deal with the subject for its proper and effective management. There are a number of pieces of legislation that cover a wide range of issues, from the generation to the collection, transport and finally either treatment or disposal of healthcare waste. Some of the important Acts and Regulations are referred below.

- The Environmental Protection Act⁶²,
- The Waste Management Licensing Regulations⁶³,
- The Pollution Prevention and Control (England and Wales) Regulations⁶⁴,
- Landfill Regulations⁶⁵
- Hazardous Waste Regulations⁶⁶,
- The Hazardous Waste Directives⁶⁷

⁶⁰Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 8 (2013), *Available at:* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf (Last visited on Jan. 7, 2017).

⁶¹ *Ibid* at pg. 9.

⁶²The Environment Protection Act, 1990.

⁶³Waste Management Licensing Regulations, 1994.

⁶⁴ Pollution Prevention and Control (England and Wales) Regulations 2000.

⁶⁵ Landfill (England and Wales) (Amendment) Regulations 2005.

⁶⁶ Hazardous Waste (England and Wales) Regulations 2006, The Hazardous Waste Regulations and The Hazardous Waste (Northern Ireland) Regulations 2005 replaced The Special Waste Regulations in England, Wales and Northern Ireland.

⁶⁷ The Hazardous Waste Directive, 2011.

- Special Waste Amendment (Scotland) Regulations⁶⁸
- Controlled Waste Regulations⁶⁹
- Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (the Carriage Regulations)⁷⁰
- Control of Substances Hazardous to Health (COSHH) Regulations⁷¹ provides for the legislative framework for waste management activities. These regulations specify, through waste management licensing and related exemptions and pollution prevention control permits, how waste should be managed and specific conditions that sites must adhere to.

The above mentioned Rules and Regulations can be better understood by dividing it under the three tier legislations for its effective management to deal with specific health hazardous.

1. Infection control and health and safety legislation,
2. Environment and waste legislation and
3. Transport legislation.

8.5.1.1 The Environment Protection Act, 1990

The main legislation governing clinical waste disposal is the Environmental Protection Act 1990. The Environmental Protection Act deals with issues relating to waste on land, defining all aspects of waste management and places a duty on local authorities to collect waste. The Act has spread over 9 parts including 16 schedules.

8.5.1.1.1 The Duty of Care

Part II sets out the main aspect of duty of care which is to be read with Part I for authorisations. A key element to the duty of care is the requirement for producers

⁶⁸ Special Waste Amendment (Scotland) Regulations 2004.

⁶⁹ Controlled Waste (Duty of Care) (Amendment) Regulations (Northern Ireland) 2004, The Controlled Waste Regulations, 2012.

⁷⁰ Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004.

⁷¹ Control of Substances Hazardous to Health (COSHH) Regulations, 2002.

to ensure that a written description, adequately describing the type and quantity of waste, is provided for transfer of the waste as it is moved from point of production to point of final disposal. The Act states that all producers of waste have a duty of care to ensure the correct and proper management of waste is performed and states that it is “unlawful to deposit, recover or dispose of controlled clinical waste without a waste management licence, or in a way that causes pollution of the environment or harm to human health”⁷². The duty requires such persons to ensure that there is no unauthorised or harmful deposit, treatment or disposal of the waste, to prevent the escape of the waste from their control or that of any other person, and on the transfer of the waste to ensure that the transfer is only to an authorised person or to a person for authorised transport purposes and that a written description of the waste is also transferred. Some other statutory requirements covering duty of care in waste management are contained in:

- Section 5 of the Waste and Contaminated Land (Northern Ireland) Order,
- The Environmental Protection (Duty of Care) Regulations (England, Scotland and Wales), and
- The Controlled Waste (Duty of Care) Regulations (Northern Ireland).

Local authorities have specific duties in relation to healthcare waste. Section 45 of the Environmental Protection Act (in Northern Ireland, Article 20 of the Waste and Contaminated Land Order) states that it is the duty of each waste collection authority to arrange for the collection of household waste in its area⁷³.

The “Duty of Care” includes the following

- To prevent the illegal deposit, disposal or treatment of any waste that you have produced.
- To prevent waste from escaping from control (leaking, blowing away, being stolen etc).

⁷² Section 34(1) of the Environment Protection Act, 1990.

⁷³ Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 8 (2013), *Available at:* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf (Last visited on Jan. 17, 2017).

- To ensure that transfer of waste should be to the authorised persons.
- To ensure that any waste, transfer to another person, is accompanied by a written description. This description must be sufficient to allow others to appreciate the nature of the waste so that they can avoid committing an offence when they are managing it.

Apart from the above requirements the Duty of Care Regulations, 1991 introduced under Section 34(5) of the Environmental Protection Act, 1990 provides for the retention of the documents and also furnishing of the documents or copies of documents. Under Section 34(6) any person who fails to comply with the duty imposed by subsection (1) of Section 34 or with any requirement imposed under subsection (5) above shall be liable on summary conviction, to a fine not exceeding the statutory maximum; and on conviction on indictment, to a fine. The Waste (England and Wales) Regulations 2011 & Duty of Care (General) the Waste (England and Wales) Regulations 2011 have recently introduced a number of important changes to waste legislation, including for the first time a legal requirement to apply the waste hierarchy. They have also amended the requirements as to what must be included in Waste Transfer Notes and Hazardous Waste Consignment Notes in England and Wales⁷⁴.

The Waste (England and Wales) (Amendment) Regulations 2012 were laid before Parliament and the Welsh Assembly on 19 July 2012 and came into force on 1 October 2012. The amended regulations relate to the separate collection of waste. They amend the Waste (England and Wales) Regulations 2011 by replacing regulation 13⁷⁵. From 1st January 2015, waste collection authorities must collect

⁷⁴“Legislation Overview: Guiding you through your legal responsibilities”, Initial, *Available at*: <http://www.initial.co.uk/waste-legislation/initial-medical-waste-legislation-overview.pdf> (Last visited on Jan. 13, 2017).

⁷⁵Regulation 13 of the Waste (England and Wales) Regulations 2011 - Duties in relation to collection of waste—(1) An establishment or undertaking which collects waste paper, metal, plastic or glass must, from 1st January 2015, take all such measures to ensure separate collection of that waste as are available to the establishment or undertaking in that capacity and are—
 (a) technically, environmentally and economically practicable; and
 (b) appropriate to meet the necessary quality standards for the relevant recycling sectors.
 (2) For the avoidance of doubt, co-mingled collection (being the collection together with each other but separately from other waste of waste streams intended for recycling with a view to subsequent separation by type and nature) is a form of separate collection.
 (3) Every waste collection authority must, when making arrangements for the collection of waste paper, metal, plastic or glass, ensure that those arrangements are by way of separate collection.

waste paper, metal, plastic and glass separately. It also imposes a duty on waste collection authorities, from that date, when making arrangements for the collection of such waste, to ensure that those arrangements are by way of separate collection⁷⁶. These duties apply where separate collection is necessary to ensure that waste undergoes recovery operations in accordance with the directive and to facilitate or improve recovery; and where it is technically, environmentally and economically practicable. The duties apply to waste classified as waste from households and waste that is classified as commercial or industrial waste. The amended regulations also replaced regulation 14(2) to reflect the changes to regulation 13 to ensure a consistent approach. Consequential changes are also made to reflect changes in paragraph numbering in the new regulation 13⁷⁷.

Under the Carriage Regulations also duties have been imposed on parties at all stages of the supply chain, including manufacturers, consignors, carriers and receivers. The Carriage Regulations may require healthcare organisations to appoint or contract a Dangerous Goods Safety Adviser (DGSA). The requirement regarding DGSAs is a duty on the employer and is in large part dependent on the type/quantity of dangerous goods transported⁷⁸.

8.5.2 Hazardous Waste (England, Wales and Northern Ireland) Regulations, 2006 and Special Waste (Scotland) Regulations, 2006.

The Hazardous Waste Regulations and the List of Wastes Regulations define and regulate the segregation and movement of hazardous waste from the point of production to the final point of disposal or recovery (similar regulations apply in Northern Ireland). In England and Wales, the Hazardous Waste Regulations require that most premises producing hazardous waste be registered with the Environment Agency (EA). Premises are exempt from the requirement to register if they produce

⁷⁶“Environmental Management Guidance: Waste Legislation and Regulations,” *Available at*: <https://www.gov.uk/guidance/waste-legislation-and-regulations> (Last visited on Jan. 13, 2017).

⁷⁷ *Ibid.*

⁷⁸ Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 17 (2013), *Available at*: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf (Last visited on Jan. 20, 2017).

less than 500 kg of hazardous waste in any period of 12 months⁷⁹. In this connection it should be mentioned that for the transportation of the waste consignment notes are required. They are available from the respective environmental regulators (EA, Scottish Environment Protection Agency (SEPA) or Northern Ireland Environment Agency (NIEA). They may also be supplied by the waste contractor. The producer is legally responsible for ensuring the accuracy of a consignment note and in some instances it may be appropriate to seek advice from the waste contractor.

In Northern Ireland and Scotland, producers (or consignors) of hazardous waste are not required to register with the regulatory authority (NIEA and SEPA, respectively). Instead, they are required to provide 72 hours' prior notification to the relevant regulator of their intention to move hazardous/ special waste. The Regulations do not provide comprehensive guidance on the classification of waste. The EA, SEPA and NIEA produced a joint guidance document on the interpretation, definition and classification of hazardous waste entitled 'WM2'. This document is based on supporting European Directives and test methods⁸⁰.

8.5.3 Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004

The carriage of dangerous goods is subject to regulatory control under the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (known as the Carriage Regulations), and these apply throughout the UK. The Carriage Regulations are intended to reduce, to reasonable levels, the risk of harm or damage to people, property and the environment posed by the carriage of dangerous goods. The Carriage Regulations do not specifically regulate waste materials. They apply to all dangerous goods regardless of whether a substance is waste or not. Goods are assessed on their hazardous characteristics and, if applicable, are classified into one of nine classes of dangerous goods⁸¹.

⁷⁹“Developing an European Union Standardised Approach to Vocational Qualification in the Healthcare Waste,” Assessment and National Report of the UK Healthcare Sector, European Healthcare Waste Management, pg. 12, Available at: <http://hcwm.eu/media/deliverables/Country%20Reports%20Healthcare%20System%20Overviews/3.2%20HCWM%20System%20Overview%20UK.pdf> (Last visited on Jan. 21, 2017).

⁸⁰ *Ibid.*

⁸¹ *Ibid.* at pg.17.

The regulations cover among other things: training of personnel involved in the chain of distribution, substance classification and identification, packaging, marking, labelling and documentation, safety advisor, equipment and emergency procedures, safe loading, vehicle specification and operation.

8.5.4 Landfill (England and Wales) (Amendment) Regulations 2005

These Regulations set out a pollution control regime for landfills for the purpose of implementing the European Directive 99/31/EC on the landfill of waste known as “the Landfill Directive” in England and Wales. Part II deals with conditions to be included in landfill permits. Regulation 7 requires the Environment Agency to classify landfills as for hazardous waste, non-hazardous waste or inert waste. Regulation 8 sets out the requirements for conditions to be incorporated in landfill permits. These include conditions for ensuring compliance by landfill operators with the relevant requirements of these Regulations which are set out in remaining regulations in this Part and Schedules 1 (waste acceptance criteria), 2 (general requirements) and 3 (monitoring procedures). Regulation 16 provides for closure notices which may be used by the Environment Agency to initiate closure of landfills. Regulation 17 creates offences where waste is accepted contrary to the requirements which apply directly to landfill operators under paragraph 3 of Schedule 4.

8.5.5 National Evidence-Based Guidelines

National evidence-based guidelines for preventing Health-Care Associated Infection (HCAI) in National Health Service (NHS) hospitals were first published in January 2001 and updated in 2007. It was updated for the second time in the year 2012 and for publication in the year 2013. These guidelines provides for the adoption of the clinically effective measures to be followed by the healthcare workers for preventing infections in hospital and other acute healthcare settings. These guidelines can be appropriately adapted and used by all hospital practitioners. During the past two decades, HCAI have become a significant threat to patient safety. The technological advances made in the treatment of many diseases and disorders are often undermined by the transmission of infections within healthcare settings, particularly those caused by antimicrobial-resistant strains of disease-causing

microorganisms that are now endemic in many healthcare environments. It is said that many, although not all, HCAI can be prevented⁸².

8.5.6 Health Technical Memorandum

Apart from the above said laws and regulations the Health Technical Memorandum covers a range of waste streams produced directly from healthcare activities which provides practical advice for all those involved in the management of healthcare waste, and is applicable to all who come into contact with or manage healthcare waste (waste producers, waste contractors and regulators), providing a basis of common understanding for all parties including the public, all staff and third parties.⁸³

In the UK, infectious waste, including healthcare waste/clinical waste, from any source, is prohibited from being sent to landfill unless it has undergone a process of pre-treatment commonly referred to as “rendered safe”⁸⁴. The requirements of rendering safe depend on the type of waste treated and on the nature of the contaminants present in the waste. Once rendered safe, clinical waste should no longer pose a risk of infection, and, depending on the waste type, be unusable and/or unrecognisable.

England and Wales, Scotland and Northern Ireland have their own sets of laws and regulations which differ from each other. The name of the regulatory instrument is often the same although the date when it came into force may vary. In 2012-13, NHS Scotland produced 17,996 tons of clinical waste costing approximately £7.56 million in disposal costs. Healthcare facilities can realistically aim to decrease clinical

⁸²H.P. Lovedaya, *et. al.*, “National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England” *Journal of Hospital Infection* pg. S11 (2014).

⁸³ Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 1 (2013), *Available at*: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf (Last visited on Jan. 22, 2017).

⁸⁴ The Department of Health guidance document “Safe management of healthcare waste (SMHW)” defines rendering safe as “an accepted method or process which when applied: 1. demonstrates the ability to reduce the number of infectious organisms present in the waste to a level at which no additional precautions are needed to protect workers or the public against infection from the waste; 2. destroys anatomical waste such that it is no longer generally recognisable; 3. renders all clinical waste (including any equipment and sharps) unusable and unrecognisable as clinical waste; 4. destroys the component chemicals of chemical or medicinal and medicinally contaminated waste. (For laboratory autoclaves, see the “Research and laboratory facilities” sector guide.

waste by at least 15% through improved segregation practices. NHS Scotland organisations could make minimum savings of £800,000 by ensuring only clinical waste is disposed of via the clinical waste stream⁸⁵.

One effective method to be adopted is by way of removing clinical waste bins from ward areas. When a clinician visits the patient, they collect their gloves, aprons and the clinical waste bag. All clinical waste produced at the bedside is placed in the bag and then the bag is tied and taken directly to the dirty sluice area. This removes all clinical waste immediately from the ward area, reducing the chance of infections spreading. During the trial of the two areas, it was found that the orange bag waste was reduced by 50%, hygiene waste by 30%, and black bag increased by 100%. This system has now been implemented in most areas in the hospital⁸⁶.

8.6 Healthcare Waste Management in the City of London: Current Scenario

The City of London, also known as the “Square Mile”, covering little more than one square mile, is the financial and commercial centre of London, and has a daily working population of approximately 380,000⁸⁷. With a relatively small resident population of approximately 9,000, the City is primarily a business district and a visitor destination, receiving approximately 8.8 million visitors annually. The municipal waste arising in the city is 3,800 tons⁸⁸ arising from local authority collected municipal waste. The total amount of hazardous waste produced within the City of London in 2011 was 945.05 tons. 33% of the total tonnage produced (312.69 tons) infectious healthcare waste⁸⁹. The Waste Data Interrogator records shows that the hazardous waste (including the clinical waste) deposited from City of London and received by other Waste Planning Authorities over the period 2010-2014 was 174,700 tons (total waste is over 1,523,400 tons). Hazardous waste only makes up 12% of the overall total of waste in this period. In 2014, according to Waste Date Interrogator

⁸⁵ Jessica Twemlow, “Waste Prevention and Re-use Guide”, National Health Service, Scotland, Scottish Government, pg. 16, *Available at*:

<http://www.resourceefficientscotland.com/sites/default/files/NHSScotland%20Waste%20Prevention%20and%20Re-use%20Guide.pdf> (Last visited on Jan. 21, 2017).

⁸⁶ *Ibid* at pg. 18.

⁸⁷ Maria Vinogradova, “Present and Future Waste Arisings”, Report for City of London Corporation, 2013 Review for the City of London 2013 pg.1 (Oct. 24, 2013).

⁸⁸ *Ibid*.

⁸⁹ *Ibid* at pg. 42.

1,088 tons of human and animal health care wastes were generated⁹⁰. St. Bartholomew's Hospital (Bart's) is a major producer of hazardous waste in the City of London. Bart's is a 290 bed facility with 2,200 members of staff. It is Cardiac and Cancer Centre of Excellence. Around 90% of the total waste produced at the hospital is healthcare waste⁹¹. Most of the hazardous waste is being treated either in other London Boroughs or the South East of England e.g. Star Works Treatment Plant in Wokingham receives the waste from Bart's Hospital.

A study from twenty-six hospitals in London providing almost 7000 beds revealed that sixteen acute hospitals provided general medical, surgical, maternity, paediatric and a range of specialist services. The remainders were smaller community hospitals providing limited general medical, maternity and pediatric services⁹². All twenty six hospitals used wheeled and lidded carts for the storage of clinical waste. Four hospitals had additional smaller capacity carts in use, although these numbered less than twenty in total. There was approximately one clinical waste cart for every ten beds, with little variation between acute and community hospitals. All hospitals had a central cart storage area, with additional satellite storage areas in all acute hospitals. Satellite cart stores were sited both outside and inside hospital buildings, often close to stairwells or lifts, in corridors or on external walkways⁹³. An audit of the standards of clinical waste management in hospitals in London and the south-east of England revealed many shortcomings. It has seen that bulk clinical waste carts were left in corridors and walkways, obstructing stairways and fire exit routes. Basic security arrangements were inadequate or non-existent, with clinical wastes in unlocked carts left in areas freely accessible to the general public despite, in some cases, the availability of secure waste compounds that were not used⁹⁴.

It was observed that few clinical waste carts were locked; in twenty one of twenty six hospitals, the total absence of locked clinical waste carts suggests that failure to properly secure hazardous waste was a common, regular practice. The

⁹⁰Department of Built Environment, "Waste Arising and Waste Management Capacity Study Review 2016" City of London Corporation, pg. 35 (2016).

⁹¹*Ibid* at pg. 47.

⁹²J.I. Blenkharn, "Standards of Clinical Waste Management in UK Hospitals Vol. 62 Journal of Hospital Infection pg. 301 (2006).

⁹³*Ibid* at pgs. 301-302.

⁹⁴J. I. Blenkharn, "Standards of Clinical Waste Management in Hospitals-A Second Look" Vol. 121 Journal of the Royal Institute of Public Health pg. 541 (2007).

location of storage areas for filled waste carts was inadequate in most cases, with carts freely accessible to the public. Furthermore, the location of waste carts in satellite locations may contravene fire regulations by creating an unacceptable obstruction. Overfilled carts with lids that are not and cannot be closed properly create a further fire risk, and increase the probability of waste spillage⁹⁵.

The storage, transport, transfer, treatment and disposal of clinical waste are continuing to pose major problems particularly in the London area. The London Waste Regulation Authority recognising this established a Member Level Working Party to examine them. They set up an enquiry so that professional staff of the various interested organisation could identify in detail the problems⁹⁶.

A Compendium on good practice of health care waste minimisation published during 2000 and amended in 2013 provides an analysis of current waste management systems in operation within Hospital Trusts including London laying detailed case studies of good waste minimisation practice for improvement in waste elimination, re-use and recycling initiatives, sharing information, education and influencing of staff and partnership arrangements. The survey in different hospitals in England and Wales showed seventy per cent of respondents currently operate a policy to ensure operational systems to manage waste disposal also cover clinical waste⁹⁷. The Trusts are increasingly segregating clinical and domestic waste to reduce costs. Successful programmes adopt a team approach, including support from infection control backed up by staff training and the findings were that most of the trusts showed examples of good waste management practices focusing on clinical waste management and organisational costs. In the University College London Hospitals and the Middlesex Hospitals it has been seen the reduction in clinical waste from sixty to forty five tons per year resulting in the cost savings of forty thousand pound and increasing number of recycling of the waste has been made effectively.

⁹⁵ J.I. Blenkharn, "Standards of Clinical Waste Management in UK Hospitals Vol. 62 Journal of Hospital Infection pg. 303 (2006).

⁹⁶ R. G. Kensett, *The Changing Scene of Health Care and Technology* pg. 317 (Taylor & Francis e-library, London, 1st Edn. 1990).

⁹⁷ Government of United Kingdom, "Healthcare Waste Minimisation: A Compendium of Good Practice" England and Wales, Department of Health, pg. 4 (2000).

8.7 People's Republic of China

There were 3,351 thousands of beds in health institutions in 2005. In that year, the utilization rate of beds was 62.9%.⁹⁸ According to a study on safe management of wastes from healthcare activities prepared by the World Health Organization (WHO), the daily waste generation per bed calculated for China is approximately 1.8 to 2.2kg, in which about 80% waste is comparable to non-risk general domestic waste and about 20% (or 0.36 to 0.44kg) is Medical Waste (MW) requiring special regulation. The survey made during the project preparatory phase indicated that the MW generated per bed per day in China is 0.37 kg in 2005, very close to the result reported by the WHO⁹⁹ and according to a latest data (2011) published by the Ministry of Health department of China, the net amount of MW produced was approximately 1.882 million tons in 2012 with a daily average output of 1kg/bed¹⁰⁰.

As a country with a large of population of more than 1.2 billion, China produces a huge quantity of MW. In 2002, China produced 650,000 tons per year of MW or 1,780 tons a day. With the increase in population and medical institutions and the improvement of medical conditions, the quantity of MW takes the trend to increase year by year. It is estimated that the annual generation of MW in China will be up to 680,000 tons by 2010¹⁰¹. The table¹⁰² published by the government of China namely National Health Statistics Yearbook 2009-2011 shows the increasing nature of MW.

⁹⁸Li Li, "The Status and Trend of Development of Healthcare Waste in China" Chinese Research Academy of Environment Science, Beijing, pg. 4 (2015).

⁹⁹ United Nations Industrial Development Organisation, Environmentally Sustainable Management of Medical Waste - UNIDO project Project of the People's Republic of China, pg.18 (July, 2011).

¹⁰⁰ Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb.3, 2017).

¹⁰¹United Nations Industrial Development Organisation, Environmentally Sustainable Management of Medical Waste - UNIDO project Project of the People's Republic of China, pg.18 (July, 2011) Available at:

https://www.unido.org/fileadmin/user_media/About_UNIDO/Evaluation/Project_reports/Evaluation%20report%20Medwaste%20Final%20-%202011%20Aug%202011.pdf (Last visited on Feb. 5, 2017).

¹⁰² Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb. 6, 2017).

Table 2**Amount of Medical Waste (MW) from 2008-2012**

Year	Total number of Beds (10,000)	Bed occupancy rate (%)	Medical Waste (MW) (kg/bed/day)	Total MW/year (10,000)
2008	403.87	81.5	1	120.14
2009	441.66	84.7	1	136.54
2010	478.68	86.7	1	151.48
2011	515.5	88.5	1	166.52
2012	572.5	90.1	1	188.28

Studies showed that MW management process is still not being well implemented. From 2007 to 2010, there were 44890 accumulated cases in violation of ‘the regulations on the Health-Care Waste (HCW) management’ with an increase of 19.56% from cumulative total of 9745 in 2007 to 11,650 in 2010¹⁰³ despite having strict laws relating to the subject.

8.7.1 Acts, Regulations, Rules and Standards

China initiated MW management legislation much later than the developed countries such as America and Japan. In China, the medical agency varies from village clinic, town hospital, and county hospital to municipal hospital, provincial hospital, industry hospital and military hospital. Since 2003, a series of laws, regulations, or standards relating to medical waste management and disposal were formulated. Before 2003, medical waste disposal was based on the principle of “who produce, who were harmless”, regardless of the size of the hospital medical waste incinerators should be set¹⁰⁴. In 2003 year, the outbreak of “SARS”¹⁰⁵ epidemic gave rise to the urgent need to strengthen the medical waste disposal and management. In 2003-2007 years, a series of regulations, standards, norms, regulations have been

¹⁰³ *Ibid.*

¹⁰⁴ Z.B. Bao, *et. al.*, “The Development Status of Medical Waste Category, Management and Disposal in China”, cited in Yeping Wang & Jianhua Zhao, *Advances in Energy, Environment and Materials Science* pg. 213 (CRC Press, 2016).

¹⁰⁵ Severe Acute Respiratory Syndrome.

formulated¹⁰⁶. Prior to 2003, the laws, regulations or standards associated with medical waste were:

- Environmental Protection Law of China, 1989.
- Law of China on the Prevention and Control of Infectious Diseases, 1989.
- Law of the People's Republic of China on the Prevention and Control of Environment Pollution by Solid Wastes, 1995.
- Graphics Signs for Environmental Protection Solid Waste Storage (Disposal) Site, 1995.
- National List of Hazardous Wastes, 1998.
- Pollution Control Standard for Hazardous Waste Incineration 2001.
- Standard for Pollution Control on Hazardous Waste Storage, 2001.
- Standard for Pollution Control on Hazardous Waste Landfill 2001.

From 2003 to 2006, considering the dangerous affect of medical waste various other laws, regulations or standards were enacted, those are:

- **Regulation on Medical Waste Management, 2003**, the first laws about the MW management regulations which marked standardisation and legalisation of MW from generation, storage, transportation and centralised disposal, to strengthen safety management of medical waste, prevent the spread of disease and protect the environment.
- **Technical Standard for Medical Waste Transport Vehicle, 2003** to provide provisions for the special requirement of medical waste transport vehicles, stipulate that the finalized thermal insulation and refrigerated truck transport of medical waste.
- **Technical Standard for Medical Waste Incinerator, 2003** for the prevention and treatment of medical waste incinerator pollution to environment, regulate incinerator design, manufacture, performance and safety use.

¹⁰⁶ Z.B. Bao, et. al., "The Development Status of Medical Waste Category, Management and Disposal in China," cited in Yeping Wang & Jianhua Zhao, *Advances in Energy, Environment and Materials Science*, pg. 214 (CRC Press, 2016).

- **The Classification Catalogue of Medical Waste, 2003** standardise the classification and characteristics of medical waste, identify their common components or specific name.
- **Measures for Medical Wastes Management of Medical and Health Institutions, 2003**, provided provisions for medical waste management of medical and health institutions, effectively prevent and control hazards of medical waste on human health and the environment.
- **The Centralised Disposal Technical Specifications of Medical Waste (on Trial), 2003**, laid down the standard for technical requirements of medical waste temporary storage, transportation and disposal, the training and safety requirements of the relevant personnel, incidents prevention and response measures.
- **The Management Administrative Punishment Measures of Medical Waste, 2004**, clear the respective responsibilities of above the county level health administrative departments and environmental protection departments, provision for the administrative penalties of violating medical waste management regulations.
- **Technical Specification Medial Waste Centralized Incineration Facility, 2005** laid down provisions for the construction of medical waste incineration projects, prevent the pollution of medical waste incineration to the environment.
- **Technical Specification for Chemical Disinfection Centralised Treatment Engineering on Medical Waste (on Trial), 2006** provides provisions for the practical application medical waste chemical disinfection treatment technologies, guide the planning, design, construction, inspection and operational management of medical waste chemical disinfection treatment projects.
- **Technical Specifications for Microwave Disinfection Centralised Treatment Engineering on Medical Waste (on Trial), 2006**, provisions for the practical application of medical waste microwave sterilization treatment technology practice, guide the planning, design, construction, operation and management of medical waste microwave disinfection treatment project.

According to the Regulation on Medical Waste Management, 2003, medical waste refers to “directly or indirectly infectious, or poisonous, or otherwise harmful wastes generated by medical institutions in medical treatment, prevention, health care, and other relevant activities”. This regulation was significant in that it:

- Represented the first legal definition of medical waste in Chinese law;
- Provided clear guidelines for each stage of the treatment of medical waste;
- Mandated centralised treatment by authorized entities;
- Required waste generators to properly classify and manage medical wastes; and,
- Mandated that cities above the county level complete the construction of medical waste treatment facilities by 2004.

In the Category Catalogue of Healthcare Waste of China, healthcare waste was divided into 5 categories, which were infectious waste, pathological waste, sharps, pharmaceutical waste and chemical waste¹⁰⁷.

Following the issuance of the Regulation on Control of Medical Waste, many other departments within the Chinese government such as the Ministry of Health (MOH) also issued relevant regulations and guidelines. In October 2003, the MOH and Ministry of Environmental Protection (MEP) published the Inventory of Medical Waste Classification, which classified medical wastes into five groups. During the same month, MOH promulgated the measures for Medical Wastes Management of Medical and Health Institutions¹⁰⁸.

Thus, according to the needs and for the effective management and disposal, China has established laws and regulations, policies and standard. A number of medical waste disposal facilities have also established, so that the management and

¹⁰⁷ Li Li, “The Status and Trend of Development of Healthcare Waste in China” Chinese Research Academy of Environment Science, Beijing, pg.4 (2015).

¹⁰⁸ Mao Zhimin, “Waste Mismanagement: China’s Struggle with Medical Trash” China Environment Forum, (June, 2009).

disposal would be in accordance with the standard provided in the laws. Again in 2007 to 2014, China further developed a series of technological standards relating to disposal detail so that medical waste would possibly be disposed of as per such standard to ensure its safety and effectiveness. Such standards are:

- **The Technology Standard for Hazardous Waste (Including Medical Waste) Incineration Disposal Facilities Dioxin Emission Monitoring, 2007**, provisions for dioxin-like pollutants monitoring in exhaust, emission of hazardous waste incineration facilities and medical waste incineration facilities, reducing dioxin pollution to the environment.
- **Standard of Packaging Bags, Containers and Warning Symbols Specific to Medical Waste, 2008**, provisions for medical wastes bags, tool box and containers technical requirements, corresponding test methods and inspection rules and regulations for medical waste warning signs.
- **Perfectly Revised National List of Hazardous Wastes, 2008**, specifies medical waste belonging to hazardous waste.
- **Technical Specifications for the Supervision and Management to the Operation of Centralised Incineration Disposal Facilities for Hazardous Waste (on Trial)**, strengthen supervision and management of medical waste incineration facilities operation, to ensure that the standardized operation of medical waste incineration facility.
- **Technical Specification of Performance Testing for Facilities of Hazardous Waste (Including Medical Waste) Incineration, 2010**, provisions for test content, procedures and technical requirements of hazardous waste (including medical waste) incineration facilities involved in performance testing.
- **Technical Specifications for Collection, Storage, Transportation of Hazardous Waste, 2012**, provisions for technical requirements of hazardous waste collection, storage and transport.
- **Technical Specifications for Hospital Sewage Treatment, 2013**, provisions for Standard design, construction and operation management of hospital sewage treatment works to prevent hospital sewage to pollute the environment.

- **Technical Guidelines for Solid Waste Treatment & Disposition Engineering, 2013**, provides for general technical requirements for solid waste disposal engineering design, construction, inspection, operation and maintenance.
- **General Specifications of Engineering and Technology for Hazardous Waste Disposal, 2014**, specifies the technical requirement and regulations concerning the application of hazardous waste disposal technology and engineering design construction, inspection, operation and management process.

Therefore, with the social and economic development, new diseases, new drugs and medical devices are emerging; medical waste output growth accelerated and medical waste pollution accidents have become frequent. Despite various laws, regulations and standards there is great disparity of economic development and allocation of medical resources among and within the Eastern, Central and Western regions of China. This has caused significant regional differences in the type and quantity of Medical Waste. Due to lack of data and absence of relevant surveys and statistics, it is difficult to make a precise estimation on the quantities of MW being produced at present in China.

Pursuant to the Regulations on Medical Waste (MW) Management, most Medical Institutions have established a MW management system to deal with matters relating to hospital MW management. Duties of departments involved in the MW management are defined in the management system. For example, the Department of General Affairs and Logistics is responsible for the collection, transfer and temporary storage of health care wastes. Healthcare doctors and nurses classify MW and the department of infection control is responsible for supervision, inspection and feedback on the treatment of MW. Emergency response plans in case of leakage of healthcare have also been established.

There are several HCW disposal methods, such as incineration, steam sterilization, microwave sanitation, chemical disinfection, dry heat disinfection, and disinfection with superheated steam, solidification, recycling and land filling. Only incineration technology has been implemented in China. HCW incinerators need high

operation and maintenance costs and require ash disposal cost as well. But up to now China hasn't find better way to deal with the HCW for reducing pollution¹⁰⁹. The National Plan for the Construction of Disposal Facilities for Hazardous Waste and Medical Waste undertaken in 2003 was an important steps towards the centralized disposal of such wastes. The purpose of this National Plan was to solve the problems such as lack of disposal ability of healthcare waste, the low technical level of disposal facilities and the serious secondary pollution. It was brought forward 300 centralized disposal facilities for healthcare waste would be constructed before 2007. The increased ability of disposal would be 2080 ton/day. The healthcare waste in China would be stored and disposed safely after the construction of those facilities¹¹⁰.

Although number of laws are in existence but review shows that the existing laws and regulations are too general, and there is a lack of detailed rules to support their implementation. The standards for the control of pollution from incineration are too low, and the standards for the control of pollution from non-incineration treatment are still missing¹¹¹. In addition to this there is lack of commercially available options for diversified investment and professional operation in MW treatment and disposal facilities¹¹².

8.8 Bio-medical Waste Scenario in Beijing, China

Beijing, the capital of China, is a huge metropolitan area with a population that reached 21.15 million in 2014. And like many other large and rapidly growing cities in China, it continues to face waste management issues as waste generation exceeds capacity¹¹³. Beijing has a major garbage problem. The city generates 18,000 tons of waste a day, 7,000 tons more than the capacity of disposal plants¹¹⁴. Medical

¹⁰⁹ Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.w.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb.16, 2017).

¹¹⁰ Li Li, "The Status and Trend of Development of Healthcare Waste in China" Chinese Research Academy of Environment Science, Beijing, pgs. 9-10 (2015).

¹¹¹ *Ibid* at pg. 16.

¹¹² *Ibid* at pg. 26.

¹¹³ Steven Cohen, *et. al.*, "Waste Management Practices in New York City, Hong Kong and Beijing" pg. 9 (Dec. 2015), Available at: <http://www.columbia.edu/~sc32/documents/ALEP%20Waste%20Managment%20FINAL.pdf> (Last visited on Feb. 15, 2017).

¹¹⁴ Gina Marie Cheeseman, "Beijing's Trash Problem Needs More Recycling, No Deodorant Guns," Triple Pundit, (Apr. 20, 2010).

waste, totaling 40 tons a day, poses a pressing problem after the outbreak of the SARS (severe acute respiratory syndrome) epidemic in the spring of 2003, which killed 193 people in Beijing¹¹⁵.

Among the four directly governed city regions, Beijing, Chongqing, Shanghai, and Tianjin, Tianjin achieved 100 percent collected treatment of medical waste since 2005 while Beijing and Shanghai lagged behind. However, Shanghai improved its collected treatment rate of medical waste from 31.6 percent in 2005 to 78.37 percent in 2007. Beijing also achieved significant improvement in terms of waste treatment during its preparation for the Olympic Games. During 2004 and 2005, two medical waste treatment facilities with daily treatment capacity at 60 tons were completed, well covering Beijing's medical waste generation rate of 41 tons/day¹¹⁶.

China has adopted new developmental technology to deal with the various problems including handling the medical waste problem. Using barcode technology to manage drugstore inventories and track down drugs, adopting Radio Frequency Identification (RFID) technology to prevent new-born babies from getting mixed up in hospitals, employing medical waste monitoring systems to manage medical waste, such new weapons are quietly changing the management of modern hospitals and are allowing hospital managers to get the most out of the information age¹¹⁷. Barcode technology can play an important role not only in medical waste management but in drug tracking and stock management, patient management and tracking, and consumables management. A major hospital in Hangzhou adopted barcode technology to manage its inspection department, while Beijing's Tiantan Hospital employed it to manage its valuable consumables. The hardware needed was just one Zebra printing device, while the backstage system uses the corresponding support from the hospital HIS¹¹⁸.

Further, in 2006, Beijing Friendship Hospital implemented a medical waste management information system that used the hospital's existing PC terminals and

¹¹⁵ Garbage Treatment Gets a Facelift, *China Daily*, Feb. 13, 2004.

¹¹⁶ Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb.19, 2017).

¹¹⁷ Wei Yusu, Information Technology quietly Changes the face of Hospitals, *Medicine Economic News*.

¹¹⁸ *Ibid.*

barcode technology to identify all medical waste. All nursing stations are equipped with RFID devices to complete the transfer of waste between nurses and transportation staff. Medical waste transfer stations are equipped with PC terminals, electronic scales, barcode scanning guns, RFID devices and printers to complete the weighing and transfer of medical waste. To avoid cross contamination, non-contact identification technology is adopted. In addition, the system exchanges information with the death management system, the in-hospital contamination management system and the contagious disease management system¹¹⁹.

Although Beijing's first medical waste disposal facility began its operation early in 2004 in the capital city's suburban Daxing District in the Nangong Medical Waste Disposal Plant, which cost 10 million yuan (about US\$1.2 million) which had the capacity to dispose of 15 of the 41 tons of medical wastes the city produces each day¹²⁰, instances of illegal disposal of such waste is still continuing. According to an undercover report published on 1st April, 2015 by the Beijing Times,¹²¹ unprocessed chemical waste from a tank at the Shunyi District branch of the Beijing Ditan Hospital was dumped into a storm drain via a 30-meter-long pipe and such disposal continued for several days. It shows that despite having strict laws the situation continues to prevail although cases are numerous. Towards eradicating medical waste, China has adopted centralised medical waste disposal technologies which can be divided into two major categories of incineration and non-incineration. The adoption of medical waste high-temperature steam sterilisation technology as a non-incineration technology is currently applied more widely. Although it suffers from shortcomings, however, it produces no dust and dioxin which is also considered as cause of concern from such disposal technology. Moreover, due to small investment, low operation cost and flexible operation etc. it has been consider as an important and effective method of disposal technology to be followed by the countries of the world.

¹¹⁹ *Ibid.*

¹²⁰“Beijing's First Medical Waste Disposal Facility Begins Operation”, *Xinhua News Agency, Environment*, Dec. 30, 2004.

¹²¹“Illegal Medical Waste Dumping Story Sparks Probe”, *Sanghai Daily*, April 5, 2015.

In a bid to reduce pollution and protect public health, China has decided to impose harsh punishment on those who will fail to handle the medical waste properly. according to criminal law, those who severely pollute the environment can receive up to three years in prison, while those causing extreme damage can be sentenced to between three and seven years in prison plus a fine¹²². Companies or government units that illegally collect, store, transport, and handle medical waste will have their licences revoked and heavily fined, reported Xinhua citing a statement from the National Health and Family Planning Commission. The commission said it will strengthen the monitoring of medical waste disposal companies and units, and cooperate with environmental authorities to shut down substandard waste disposal facilities. It will transfer those involved in environment pollution crimes to police authorities. It also urged local authorities to establish a sound price system for medical waste procurement before the end of 2015 and improve their hazard-free disposal of medical waste¹²³.

Recently, the police in Nanjing, Jiangsu province, arrested three suspects who allegedly traded thousands of tone of medical waste that was later processed into disposable tableware and fake brand-name toys¹²⁴. It is to be noted that China only allows authorised companies specialising in medical waste to engage in such business and such steps is as part of the recycling of medical waste for the purpose of reusing the same.

8.9 Analysis of the Laws of USA, UK and China for Better Management of Bio-Medical Waste in India

From the numerous laws, rules, regulations, guidelines etc. of USA, UK and China on Bio-Medical Waste, it is clear that respective countries have tried to enact comprehensive laws with a view to mitigate and to completely eradicate the problem relating to the subject. Although it cannot be concluded beyond doubt that these countries are successful in resolving the Bio-Medical Waste problem within the ambit

¹²² Cang Wei, "Medical Waste turned into Tableware, Toys", *China Daily*, Dec. 21, 2016.

¹²³ "China to Punish Harshly over Medical Waste Disposal", *Daily News & Analysis*, Essel Group, Jan. 9, 2014.

¹²⁴ Cang Wei, "Medical Waste turned into Tableware, Toys", *China Daily*, Dec. 21, 2016.

of such laws, still such laws are considered effective and the inclusion of the same in the Bio-Medical Waste related laws of India would help in tackling the problem. There is no denying the fact that despite having numerous laws of these countries, in practice the proper and effective management of the Bio-Medical Waste is not very satisfactory. Yet, it can be said that the steps undertaken by the developed countries would help the underdeveloped and developing countries to cope up with the menace relating to the subject by following their footsteps. An analysis of the various laws of these countries shows that the how new and advanced technology has helped them in reducing the menace of Bio-Medical Waste in a cost effective manner. However, the high cost of installation of the advance technology, the lack of positive attitude and awareness are putting hindrances on the way to the successful management of the same. Further, the existence of new pollutant necessitated the application of new technology which is required to be invented at first. The invention of the new technology and its manufacture is a time consuming issue and by the time the same is available in market the pollution increases to certain extent that the problem remains the same. However, within their respective capacity these countries are making all effort for the successful management of the Bio-Medical Waste and the outcome is the effective reduction in the quantity of the Bio-Medical Waste which in turn help in the reduction of the cost of Bio-Medical Waste management.

8.5 An Overview

From the above analysis it can be concluded that although the developed countries like USA, UK and China are facing problem in the proper and effective management and disposal of the Bio-Medical Waste still the positive effort they have shown would obviously help them in eradicating the Bio-Medical Waste issue in the long run. In this background it can be easily imagine the existing scenario prevailing in the developing and the underdeveloped countries. Apart from the high cost of installation of the advance technology, the lack of positive attitude and awareness is hindering in the way for the successful management of the Bio-Medical Waste. Further, the existence of new pollutant gives rise to the immediate necessity of installation of new technology which is not possible due to the financial crunch. Moreover due to lack of proper training and education among the health care

personnel the existing Bio-Medical Waste scenario in the country remained unchanged. Instead of reducing the quantity of the Bio-Medical Waste the same is increasing in nature and despite having the Rules the situation is worsening.

CHAPTER IX

STATUS OF THE BIO-MEDICAL WASTE DISPOSAL SCENARIO IN SILIGURI TOWN: AN EMPIRICAL STUDY

The present study relating to Bio-Medical Waste disposal requires an empirical study in the Siliguri Town to corroborate and substantiate the doctrinal findings at the national level. In order to do so a locational and demographic understanding of Siliguri is essential. Hence the following sketch upon Siliguri.

9.1 Geographical location of Siliguri Town

Known as the gateway of the North East India and is situated 392 feet above mean sea level in the foothills of the Himalayas on the banks of the river Mahananda, the Siliguri Sub-division is one of the Sub-divisions of Darjeeling that has a Corporation, the Siliguri Municipal Corporation. Its geographical location is at 26.71°N and 88.43°E. It is a unique city consisted of total forty-seven wards under the Corporation. It has four community development blocks, namely, Matigara, Naxalbari, Phansidewa and Khoribari. It also occupies an extremely important position for Sikkim, Darjeeling, Kurseong and Kalimpong. Sharing the international borders with Bangladesh, Nepal and Bhutan it has a great potential in respect of trade, commerce and many more. It is one of the most rapidly developing metropolises of the State. Situated in Darjeeling district, it is the District's largest city and the third big city in the State after Kolkata and Asansol.

9.2 Population of Siliguri

As per provisional reports of Census India, population of Siliguri in 2011 is 513,264 and it was 472,374 according to the 2001 Census; of which male and female are 263,702 and 249,562 respectively. Although Siliguri city has population of 513,264; its urban/metropolitan population is 705,579 of which 362,523 are males and 343,056 are females¹. The population accounted for 0.56% of the total State's population which includes the population from the wards falling under the Jalpaiguri District because Siliguri Municipal Corporation consisted of the wards falling under Jalpaiguri District also. The population of the Sub-Division which falls in the

¹ Available at: <http://www.census2011.co.in/census/city/192-siliguri.html>, (Last visited on July 5, 2017).

Darjeeling district, accounts for 15.93% of the total Darjeeling population and SMC population which falls in the Jalpaiguri district accounts for 5.53% of total population of Jalpaiguri.²

Table 1

Existing scenario of Population, Literacy and Sex ratio rate of Siliguri Metropolitan Area³

Siliguri Metropolitan	Total	Male	Female
Population	7,05,579	3,62,523	3,43,056
Literates	5,16,056	2,78,867	2,37,189
Children (0-6)	77,475	39,982	37,493
Average Literacy (%)	82.16%	86.46%	77.62%
Sex Ratio	946		
Child Sex Ratio	938		

9.3 Health Care Institutions in Siliguri Town

With the increasing number of populations, the need arises for the health care service sectors to provide health care to the patients as a result of which there has been a tremendous growth of the health care institutions throughout the country. The scenario of the Siliguri city is not different from other parts of the country which can be seen from the following data.

In Siliguri healthcare services are provided by both Government as well as private health care institutions. As per the final report published by the Government of India, Ministry of Urban Development in the year 2015 as part of the City Development Plan

² *Ibid.*

³ *Ibid.*

for Siliguri-2041⁴, the city has four major Government hospitals, viz., the Siliguri District Hospital (SDH), TB Hospital, NJP Railway Hospital, North Bengal Medical College & Hospital and one veterinary hospital. In addition to this, the city has thirty three (33) nursing homes, and 50-60 pathology⁵. But according to the health care inventory published by the West Bengal Pollution Control Board in the year 2005 there were total ninety nine (99) health care institutions for the entire District of Darjeeling out of which forty four (44) is run by the West Bengal government and fifty five (55) is private consisted of total 4762 beds.

The above data present a clear picture of increasing number of the health care institutions within a gap of ten years. Out of the total fifty five nursing homes in the District of Darjeeling, Siliguri itself has thirty three nursing homes and remaining twenty two are in other Sub-Divisions.

Table 2

Number of the Health Care Institutions in and around Siliguri Town

Nature of Health care institutions	Total Number of Health care institutions	Total Number of beds
Government	4	1009 ⁶
Private	33	1318 ⁷
Public Private Partnership (PPP)	Nil	Nil

⁴ Government of India, Ministry of Urban Development, City Development Plan for Siliguri-2041 (Final Report), A Joint Partnership Programme between Ministry of Urban Development, Government of India and the World Bank, (April, 2015) Available at: siligurismc.in/userfiles/file/siliguri-CDP-final-report-29April15.pdf (Last visited on July 7, 2017).

⁵ *Ibid.*

⁶ In NBMC&H-589 Available at: https://www.wbhealth.gov.in/other_files/Hospitals.pdf, Siliguri Sub-Divisional Hospital-320 Available at: https://www.wbhealth.gov.in/uploaded_files/go/ms_209.pdf, NJP Railway Hospital-100 Available at: http://www.indianrailways.gov.in/railwayboard/uploads/directorate/health/health_1.jsp

⁷ Based on Bio-Medical Waste Inventory published by the West Bengal Pollution Control Board (2010), also information received from different health care institutions in Siliguri Available at: http://web.wbpcb.gov.in/html/downloads/report_BioMedicalWaste.pdf (Last visited on Aug. 2, 2017).

The benefit of the growing number of health care institutions is that the patients from the city Siliguri and the surrounding cities, States and the countries can avail the advanced health care services within their reach and with less expense without going other places. It has other side also. Apart from providing health care services, it is generating bulk quantity of the Bio-Medical Waste which is required to be disposed off in accordance with the Bio-Medical Waste Management Rules, 2016. The problem of treatment and disposal of Bio-Medical Waste is an extremely important issue because improper disposal of the same would have far reaching impact on the health as well as on the environment. The question therefore arises whether the proper disposal of such wastes is made in accordance with the Rules or the disposal of the same is made in gross violation of it. It is important to note that the improper disposal of the Bio-Medical Waste leads to various infectious diseases in particular and the environment pollution in general in the surrounding areas. With a view to understand the existing Bio-Medical Waste disposal scenario prevailing in the various health care institutions in the city, the researcher has undertaken an empirical survey under this chapter to highlight on the current disposal scenario of Bio-Medical Waste in the city.

9.4 The Study Area/Universe

The universe under the study is a finite universe containing four (4) Government health care institutions and thirty three (33) private health care institutions. The population being a finite population and yet of different characterisations, the same is divided under the following category:

- a. Government Hospitals and
- b. Private health care institutions:
 - i. Private Hospitals and
 - ii. Nursing Homes.

In the above segregation the researcher had studied all the four Government hospitals. This is important because being a part and parcel of the Government, it is their fundamental duty to abide by the laws and policies laid down by the Government itself. Hence, the researcher has studied the method of waste disposal in the Government hospitals.

Of the second category i.e. private health care institutions, there are the following private hospitals within the precincts of Siliguri in the above identified geographical area. They are:

1. Anandaloke Multi Speciality Hospital;
2. Siliguri Greater Lions Eye Hospital;
3. Sai Hospital and
4. Heritage Hospital.

The researcher studied all the four private health care institutions and has compared the process of Bio-Medical Waste disposal in the Government and private health care institutions in the category of hospitals.

In addition to the above, the researcher has also studied the nursing homes. The residue number being twenty eight (28), the researcher has done random sampling of the twenty eight (28) health care institutions picking every fourth health care institutions. At the beginning, the health care institutions were randomly numbered between one to twenty nine and by picking the fourth institutions, the following health care institutions were selected:

1. Nivedita Nursing Home & Poly Clinic;
2. Dr. Mahpal's Nursing Home Pvt. Ltd.;
3. North Bengal Neuro Center;
4. Mitra's Polyclinic;
5. Siliguri Nursing Home;
6. Arogya Niketan; and
7. Neotia Getwell.

9.5 Methodology adopted for the Collection of Data

Collection of the data is an important aspect for any empirical research. The researcher had collected data from various health care personnel engaged in the whole process of management of the Bio-Medical Waste including its disposal on the basis of which analysis would be made to derive some effectively collected database.

The methodology adopted for collecting data was questionnaire method and interview method. The question was open ended question that is annexed as annexure to the present thesis. The interview was taken verbally and the result was manually written down.

The health care personnel that were interviewed were administrative officers, doctors, nurses, house-keepers, sweepers and laboratory technicians. The administrative officers were interviewed because they are involved in the implementation and the execution of the Bio-Medical Waste disposal policy that is adopted by the health care institutions. The doctors (mostly surgeons) were interviewed because the post-operative waste disposal procedure is followed by them. The nurses are important in the waste disposal chain as post-surgical waste disposal and waste disposal at other stages are handled by them. The house-keepers are general supervisors to ensure ground level execution of proceedings. The sweepers do the actual disposal and laboratory technicians were interviewed to understand the Bio-Medical Waste emanating from the path lab. In addition to the above, the researcher has observed the segregation of the waste and its respective disposal.

Questionnaire survey was conducted in order to build a requisite database on various aspects of waste management, its treatment and disposal methods, awareness among the target groups, recycling of waste, etc. which in turn became a storehouse of information. A total of thirty (30) questions were set in the questionnaire part with a view to obtain detail information about the Bio-Medical Waste disposal practices followed in various health care institutions in Siliguri. The questionnaire was divided into three parts:

1. The first part consisted of ten questions relating to the knowledge of Bio-Medical Waste Management Rules, type/category of waste, its nature and the various processes for its management as per the Rules ;
2. In the second part, it contained twelve questions involving level of awareness such as segregation as per colour coding, autoclaving, disposal of used needles etc.;
3. The last part consisted of total eight questions that focus on the method of disposal of the Bio-Medical Waste. The various disposal methods such as sterilisation, shredding, autoclaving etc. had included among others in this part of question.

Data was obtained from the documents available in the various health care institutions. Selected health care institutions were visited frequently with a view to check available documents on Bio-Medical Waste management and disposal. It includes maintenance of Bio-Medical Waste Register, receipt submitted by the

Greenzen Bio Pvt. Ltd., a private concern, engaged in the final disposal, to each health care institution based on per day collection of different types of Bio-Medical Waste alongwith its quantity. The purpose of the verification of the on-record data with a view to cross check it with the data collected during survey in order find out the difference between the two. This would help in highlighting on the correct existing scenario on the Bio-Medical Waste management and disposal.

Apart from the visits in various hospitals, nursing homes etc., the researcher had also visited to the Fulbari site, within the District of Jalpaiguri where disposal of particular category of Bio-Medical Waste is being made through incineration, autoclaving, shredding etc. by the said Greenzen Bio Pvt. Ltd. Such visit was made with a view to provide an insight to the current disposal and treatment practices followed in Siliguri and to reach to a findings as to whether the disposal is made in accordance with the existing Bio-Medical Waste Rules, 2016 or not. This is most efficient way of gathering information and a way of filling the gap between paper work and practical work.

9.6 Limitations

The following are the limitations/obstructions that put hindrances while conducting the survey in the arena of Bio-Medical Waste disposal within the Siliguri town:

1. **Difficulty in obtaining permission-** It was not easy to obtain permission from the authority of the health care institutions. Apart from visiting the health care institutions, permission was sought through e-mail and the outcome was that it was either denied or permission was granted restricting the time. Sometimes the survey in some health care institution was restricted only to a particular unit or department. The researcher has been researching for five years but not able to get permissions from the authorities. It took lot of persuasion on the part of the researcher to obtain permissions.
2. **Non-co-operative attitude-**In some health care institutions the authority was reluctant in providing the actual information on the exact quantity of the Bio-medical Waste generates and was sent to disposed off. Despite due

permission, the person in charge of maintenance of the Register had denied to produce such documents.

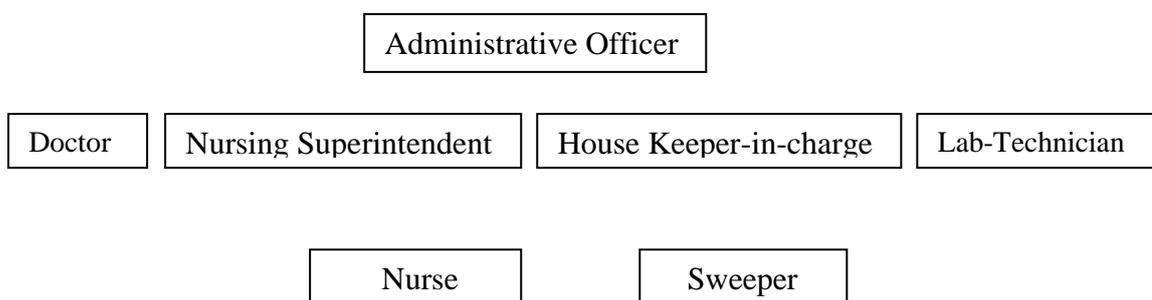
3. **Illiteracy**-Another problem was faced while interviewing the sweepers as they were unable to respond to the written set of questionnaire due to their illiteracy.

9.7 The Respondents

A total of one hundred and forty two (142) health care personnel have been interviewed from fifteen (15) hospitals, four each from Government and private hospitals and seven nursing homes located in Siliguri engaged in different occupations as mentioned above. They are the main study population to whom a set of questions was given or interviewed for the purpose of collection of the data. Based on their respective occupation they can be place in the following hierarchy:

Table 3

Hierarchical structure of health care personnel engaged in the disposal of Bio-Medical Waste



The hierarchical position of different personnel in the health care institutions is worth mentioning. The selection was made taking into account the involvement of each personnel in the process of disposal of the Bio-Medical Waste. They can be divided into two groups, those who are directly involved and the rests are connected indirectly. The first group consisted of nurses, sweepers etc. and the other group includes personnel like administrative officer, house keeper, lab-technician, doctor etc. It is the duty of the house keeper, administrative officers etc. to ensure the proper disposal of the Bio-Medical Waste as per the Medical Waste Management Rules, 2016.

The number of respondents from different Government and private hospitals and Nursing homes who were questioned and interviewed has been referred in the table below:

Table 4

Status of the total number of health care personnel questioned and interviewed

Total number of respondent	Category of respondent	Govt. Hospital (Total-4)	Private Hospital (Total-4)	Nursing Home (Total-7)	Total in each category	% of respondent in each category
142	Admin. Officer	2	4	6	12	12 (8%)
	Doctor	7	2	7	16	16 (11%)
	House-keeper	0	4	5	09	09 (6%)
	Lab-Technician	1	2	5	08	08 (6%)
	Nurse	23	14	28	65	65 (46%)
	Sweeper	14	6	12	32	32 (23%)
Grand Total					142	142 (100%)

In the present research survey out of the total thirty seven (37) Government and private hospitals and nursing homes located in Siliguri all the four (4) Government hospitals, four (4) private hospitals and seven (7) nursing homes have been studied by the researcher being the study population covering fifteen (15) health care institutions.

Among the total respondents, the above table shows that nurses constitute the highest percentage (46%) whereas house-keepers and lab-technicians constitute the lowest (6%) percentage. A good percentage (23%) of the sweepers has also been questioned because they are mainly involved in the disposal of the Bio-Medical Waste.

9.8 Assessment of the Bio-Medical Waste disposal scenario in Siliguri Town in the light of knowledge, awareness, attitude and practices followed by the respondents

The study was aimed at to assess the present disposal scenario of the Bio-Medical Waste prevailing in the various health care institutions in the city Siliguri. To achieve the goal, the researcher had prepared some thirty (30) open ended questions touching different aspects (referred in the annexure of the thesis) relating to the Bio-Medical Waste management and its disposal. All the questions were brought under three specific heads (as mentioned above) which form the data for the study by analysing of which the researcher would be in a position to highlight about the practical scenario of the Bio-Medical Waste disposal prevailing in Siliguri town.

9.8.1 Knowledge relating to the existing Rules, nature and type of Bio-Medical Waste, segregation, storage, colour bag, treatment and disposal

Detail and appropriate knowledge about the various aspects for the management of the Bio-Medical Waste in accordance with the existing Bio-Medical Waste Management Rules, 2016, is the first and foremost criteria for its proper disposal. In the absence of in-depth knowledge about the Rules consisting of the various segments for the proper management, from segregation to final disposal-a chain in the management of Bio-Medical Waste, would ultimately affect the final disposal. Therefore, considering the importance of management chain, the researcher had studied various aspects falling within the chain to know the existence of knowledge among the health care personnel engaged in the Government and private hospitals and nursing homes and the same have been referred below in the table:

9.8.1.1 Existing scenario of the Bio-Medical Waste management and disposal in the Government Hospitals

Table 5.1

Knowledge among the health care personnel regarding the management of Bio-Medical Waste

Knowledge Parameter	Administrative Officer (%)	Doctor (%)	Nurse (%)	House Keeper-incharge (%)	Sweeper (%)	Lab-Technician (%)
Knowledge about Bio-Medical Waste Rules (Old & New)	02 (100%) (old)/ 02 (100%) (new)	07 (100%) (old)/ 07 (100%) (new)	23 (78%) (old)/ 23 (26%) (new)	00 (00%) (old)/ 00 (00%) (new)	14 (14%) (old)/ 14 (0%) (new)	01 (100%) (old)/ 01 (100%) (new)
Knowledge about the nature of BMW	02 (100%)	07 (100%)	23 (87%)	00 (00%)	14 (31%)	01 (100%)
Knowledge about the types/categories of BMW	02 (100%)	07 (100%)	23 (74%)	00 (00%)	14 (57%)	01 (100%)
Knowledge about the segregation	02 (100%)	07 (100%)	23 (87%)	00 (00%)	14 (43%)	01 (100%)
Knowledge about the storage	02 (100%)	07 (100%)	23 (69%)	00 (00%)	14 (64%)	01 (100%)
Knowledge about the colour bag	02 (100%)	07 (100%)	23 (72%)	00 (00%)	14 (36%)	01 (100%)
Knowledge about the treatment	02 (100%)	07 (100%)	23 (71%)	00 (00%)	14 (29%)	01 (100%)

9.8.1.2 Situational analysis in the Government hospitals

Based on the above table the knowledge about the various management processes along with the knowledge of the existing Bio-Medical Waste Rules can be summarised as follows:

1. On the question about the existence of the Bio-Medical Waste (Handling & Management) Rules, 1998 (old) the table shows that among others the administrative officers, doctors and laboratory technician have 100% knowledge. On the other hand, on the same question, the knowledge among the sweeper is very poor constituting only 14% and that of the nurses is quite satisfactory being 78% of the total nurses.
2. Regarding the knowledge about the nature, segregation, storage, colour coding and treatment of the Bio-Medical Waste, the table shows 100% result among the administrative officers, doctors and laboratory technician. Among the nurses it is more than 70% on an average. On the other hand, the sweeper has poor knowledge on different procedures for the management of the Bio-Medical Waste. 57% of them know about the types categories of the waste which is 64% for the storage. For others, it is below 40%.
3. Regarding different type/category of Bio-Medical Waste, 74% of the nurses have knowledge whereas on the question of storage it is 69%. 72% of the nurse knows about the colour bag and about segregation 87% of the nurse has knowledge.

9.8.1.3 Existing scenario of the Bio-Medical Waste management and disposal in the Private Hospitals

Table 5.2

Knowledge among the health care personnel regarding the management of Bio-Medical Waste

Knowledge Parameter	Administrative Officer (%)	Doctor (%)	Nurse (%)	House Keeper-incharge (%)	Sweeper (%)	Lab-Technician (%)
Knowledge about Bio-Medical Waste	04 (100%) (old)/ 04 (100%)	02 (100%) (old)/ 02	14 (93%) (old)/ 14	04 (100%) (old)/ 04	06 (33%) (old)/ 06	02 (100%) (old)/ 02

Rules (Old & New)	(new)	(100%) (new)	(36%) (new)	(100%) (new)	(00 %) (new)	(50%) (new)
Knowledge about the nature of BMW	04 (100%)	02 (100%)	14 (79%)	04 (100%)	06 (66%)	02 (100%)
Knowledge about the types/categories of BMW	04 (100%)	02 (100%)	14 (86%)	04 (100%)	06 (50%)	02 (100%)
Knowledge about the segregation	04 (100%)	02 (100%)	14 (86%)	04 (100%)	06 (33%)	02 (100%)
Knowledge about the storage	04 (100%)	02 (100%)	14 (93%)	04 (100%)	06 (83%)	02 (100%)
Knowledge about the colour bag	04 (100%)	02 (100%)	14 (79%)	04 (100%)	06 (50%)	02 (100%)
Knowledge about the treatment	04 (100%)	02 (100%)	14 (93%)	04 (100%)	06 (29%)	02 (100%)

9.8.1.4 Situational analysis in the Private Hospitals

It is also important to study the existence of knowledge among the health care personnel engaged in the private hospitals as per the Bio-Medical Waste Rules. From the above table the researcher has extracted the following conclusion:

1. The knowledge about the existence of the old Rules, 1998 among the administrative officers, doctors, house-keepers and laboratory technicians is 100 %. The same is adequate among the nurses which is 93% but only 33% sweepers know about the Rules. Regarding the new Bio-Medical Waste Rules the knowledge of the nurses is not satisfactory whereas the sweepers do not have any knowledge about the new Rules.
2. 100% of the health care personnel engaged in the field of administration, house-keeping, as laboratory technician and in the profession of doctor have

the knowledge regarding the nature, category, segregation etc. of the Bio-Medical Waste. Regarding the same the nurses have adequate knowledge.

3. The sweepers, who are mainly engaged in the disposal part, do not bear satisfactory knowledge regarding the segregation and treatment as the table shows that it is 33% and 29% respectively. Half the sweepers have knowledge about the colour bags/bins which is required for the proper segregation.
4. Regarding knowledge about the storage, 83% of the sweepers responded which is 93% among the nurses.

9.8.1.5 Existing scenario of the Bio-Medical Waste management and disposal in the Nursing Homes

Table 5.3

Knowledge among the health care personnel regarding the management of Bio-Medical Waste

Knowledge Parameter	Administrative Officer (%)	Doctor (%)	Nurse (%)	House Keeper-incharge (%)	Sweeper (%)	Lab-Technician (%)
Knowledge about Bio-Medical Waste Rules (Old & New)	06 (100%) (old)/ 06 (100%) (new)	07 (100%) (old)/ 07 (100%) (new)	28 (93%) (old)/ 28 (36%) (new)	05 (100%) (old)/ 05 (80%) (new)	12 (33%) (old)/ 12 (00%) (new)	05 (100%) (old)/ 05 (80%) (new)
Knowledge about the nature of BMW	06 (100%)	07 (100%)	28 (96%)	05 (100%)	12 (67%)	05 (100%)
Knowledge about the types/categories of BMW	06 (100%)	07 (100%)	28 (89%)	05 (100%)	12 (50%)	05 (100%)
Knowledge about the segregation	06 (100%)	07 (100%)	28 (89%)	05 (100%)	12 (67%)	05 (80%)

Knowledge about the storage	06 (100%)	07 (100%)	28 (86%)	05 (100%)	12 (92%)	05 (100%)
Knowledge about the colour bag	06 (100%)	07 (100%)	28 (82%)	05 (100%)	12 (58%)	05 (100%)
Knowledge about the treatment	06 (100%)	07 (100%)	28 (96%)	05 (100%)	12 (75%)	05 (100%)

9.8.1.6 Situational analysis in the Nursing Homes

The scenario about the knowledge on various aspects of the Bio-Medical Waste in the nursing homes in Siliguri can be understood by highlighting on the following points:

1. The present scenario in the various nursing homes in Siliguri town under the study regarding the knowledge on Bio-Medical Waste Rules (old), the nature, type and other processes among the administrative officers, doctors, house-keepers etc. is 100%. The nurses and sweepers have also adequate knowledge regarding the same.
2. The knowledge about the new Rules is not adequate among the nurses and the sweepers. Only 36% of the nurses have the knowledge about the new Rules but none of the sweepers have knowledge about it.
3. 50% of the sweepers know about the different types of the Bio-Medical Waste. Whereas 58% of them know about the colour bag where primary disposal of the Bio-Medical Waste is to be made.
4. Only 67% of the sweepers have the knowledge about the segregation of the waste which constitutes 89% among the nurses. The sweepers have adequate knowledge of storage of the Bio-Medical Waste.

9.9 A comparative study

A comparative analysis of the above data from three categories of health care institutions i.e. Government hospitals, private hospitals and nursing homes is necessary to present a clear picture about the situation prevailing in these health care institutions and accordingly it would be possible for the researcher to highlight on the

important issues to improve the situation. The data shows that in all the health care institutions whether Government or private the management authorities including the doctors have a detail knowledge regarding the existence of the Bio-Medical Waste Rules, both old and new. The picture is different among the other personnel such as nurses and sweepers. It is unfortunate that in all the three health care institutions the knowledge about the new Rules among the nurses is not satisfactory. It is also important that nurses should have adequate knowledge in the management and disposal of the waste which according to the data is satisfactory but the percentage of satisfaction is variable in different health care institutions. It is clear from the above data that the sweepers, in the whole study populations do not have adequate knowledge except the knowledge about the nature of the Bio-Medical Waste and its storage. The situation is far better in nursing homes and private hospitals compare to the Government hospitals.

9.10 Awareness regarding training, storage timings, segregation as per colour coding, autoclaving, disposal of used needle etc.

It is clear from the above discussions that for understanding the disposal aspect of the Bio-Medical Waste knowledge play an important role because without adequate knowledge every step in the process of disposal would be futile. Apart from the knowledge, the awareness among the health care personnel is also an important factor which if ignored might affect the whole disposal scenario. The awareness among these personnel would obviously help in the proper disposal of the Bio-Medical Waste. For example, if the health care personnel have training it would raise their awareness in the proper handling of it which in turn would help in the disposing off the waste as per the Rules. Likewise, awareness in segregation as per the Rules would reduce the chances of improper disposal. If there is improper segregation, the disposal of some category of Bio-Medical Waste would not be made in accordance with the Bio-Medical Waste Rules. Similarly, awareness regarding autoclaving, sterilising, disinfectant etc. which are the pre-disposal method should exist otherwise the proper disposal method would not be possible. Therefore, taking into consideration the aspect of awareness as an important step towards the disposal of Bio-Medical Waste, the researcher had studied the in various Government hospitals,

private hospitals and nursing homes in Siliguri Town. The table referred below highlights on this aspect:

9.10.1 The scenario in the Government Hospitals

Table 6.1

Percentage of level of awareness among the health care personnel regarding the management prior to disposal of Bio-Medical Waste

Awareness Parameter	Administrative Officer	Doctor	Nurse	Housekeeper-in-Charge	Sweeper	Lab. Technician
Awareness on maximum storage time	02 (100%)	07 (86%)	23 (57%)	00 (00%)	14 (29%)	01 (100%)
Awareness about category wise segregation	02 (100%)	07 (100%)	23 (48%)	00 (00%)	14 (21%)	01 (100%)
Awareness about use of Disinfect Chemical	02 (100%)	07 (100%)	23 (74%)	00 (00%)	14 (36%)	01 (100%)
Awareness regarding training	02 (100%)	07 (100%)	23 (39%)	00 (00%)	14 (14%)	01 (100%)
Awareness about autoclaving	02 (100%)	07 (100%)	23 (74%)	00 (00%)	14 (29%)	01 (100%)

9.10.1.1 Situational analysis in the Government Hospitals

From the above data the following conclusion can be drawn on the question based on awareness relating to the disposal of the Bio-Medical Waste.

1. The health care personnel who are in the superior position in the hierarchy such as administrative officer, doctor, laboratory technician etc. are 100% aware on matters relating to the disinfectants, category wise segregation, autoclaving etc. But the same is not satisfactory among the sweepers ranging from 14% to 29%. On the other hand, the position of the nurses on the questions of awareness is adequate except the awareness regarding training.

Only 39% of the nurse is aware about the training which is an important aspect for the proper disposal of the Bio-Medical Waste.

2. On the question relating to awareness about category wise segregation the response among the sweeper is very poor. Only 21% of the sweepers are aware which indicates that in the Government hospitals the disposal of the Bio-Medical Waste is not proper. Similarly, the awareness regarding training and autoclaving is also poor which is 14% and 29% respectively.
3. The position of the nurses on the same question although not similar to that of the sweeper but at the same time it is not adequate. Regarding training only 39% of the nurse is aware and 48% among them are aware about the category wise segregation. Regarding autoclaving, 74% among them are aware which is satisfactory.

9.10.2 The scenario in the Private Hospitals

Table 6.2

Percentage of level of awareness among the health care personnel regarding the management and disposal of Bio-Medical Waste

Awareness Parameter	Administrative Officer	Doctor	Nurse	Housekeeper-in-Charge	Sweeper	Lab Technician
Awareness on maximum storage time	04 (100%)	02 (100%)	14 (65%)	04 (100%)	06 (33%)	02 (100%)
Awareness about category wise segregation	04 (100%)	02 (100%)	14 (71%)	04 (75%)	06 (17%)	02 (100%)
Awareness about use of Disinfect Chemical	04 (100%)	02 (100%)	14 (71%)	04 (100%)	06 (33%)	02 (100%)
Awareness regarding training	04 (100%)	02 (100%)	14 (71%)	04 (100%)	06 (50%)	02 (100%)
Awareness about autoclaving	04 (100%)	02 (50%)	14 (79%)	04 (100%)	06 (50%)	02 (100%)

9.10.2.1 Situational analysis in the Private Hospitals

The present scenario in the private hospital has been given below:

1. 100% of the administrative officer, doctor and laboratory technician are aware of the Bio-Medical Waste disposal related questions as referred in the above table.
2. The awareness among the nurses is adequate on the questions relating to training, autoclaving, chemical disinfectant etc. ranging from 65% to 79% whereas the same varies among the sweepers. For example, only 17% of them are aware about the category wise segregation.
3. The nurses are aware on the question of autoclaving which is 79%. In private hospital 71% of the nurses is aware about the disinfectant and training which is satisfactory.

9.10.3 The scenario in the Nursing Homes

Table 6.3

Percentage of level of awareness among the health care personnel regarding the management and disposal of Bio-Medical Waste

Awareness Parameter	Administrative Officer	Doctor	Nurse	Housekeeper-in-Charge	Sweeper	Lab. Technician
Awareness on maximum storage time	06 (100%)	07 (100%)	28 (79%)	05 (100%)	12 (42%)	05 (100%)
Awareness about category wise segregation	06 (100%)	07 (100%)	28 (64%)	05 (00%)	12 (25%)	05 (100%)
Awareness about use of Disinfect Chemical	06 (100%)	07 (100%)	28 (75%)	05 (100%)	12 (35%)	05 (100%)
Awareness regarding training	06 (100%)	07 (100%)	28 (79%)	05 (100%)	12 (50%)	05 (100%)

Awareness about autoclaving	06 (100%)	07 (50%)	28 (75%)	05 (100%)	12 (50%)	05 (00%)
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9.10.3.1 Situational analysis in the Nursing Homes

1. It can be said from the above table that the awareness among the administrative officer, doctors and housekeepers is 100% whereas it is adequate among nurses but poor among the sweepers.
2. Although awareness regarding segregation as per colour code is adequate among most of the health care provider but the sweepers have poor knowledge regarding the same which is only 25%. On the same question 64% nurses is aware which is also not satisfactory.
3. Regarding awareness about the autoclave, among the various health care providers, the nurses and sweepers are 75% and 50% aware.
4. The use of disinfected chemical solution for some Bio-Medical waste is adequate among the health care personnel except the sweepers which constitute only 35%.

9.11 A comparative study

The above data from all the three categories of the health care institutions shows that the superior authorities have total awareness about various important issues relating to the management and disposal of the Bio-Medical Waste. This is significant from the point of view that without being aware in the proper disposal by these authorities, the effective implementation of the disposal procedure in accordance with the existing Rules would not be possible. It is also expected that they will take all steps to make it successful. However, if we look to the data of the nurses and sweepers, it is clear that although the superior authorities are aware but the same is not effectively applied and this is the reason that there is lack of awareness among the nurses and sweepers especially among the sweepers. It is important to note that without being aware by the sweepers, the whole disposal of the Bio-Medical Waste would jeopardise. A comparative study of the above data also present the scenario that in the private hospitals and nursing homes the existing situation is better than what is

prevailing in the Government hospitals. Therefore, there is an urgent need to improve the situation so that the present scenario in the Government hospitals could be changed. Moreover, there is also a need to improve the situation in the private hospitals and nursing homes so that it would be possible to make successful disposal of the Bio-Medical Waste.

9.12 Disposal of Bio-Medical Waste in the Government and private hospitals and in the nursing homes

The very purpose of the Bio-Medical Waste Management Rules, 2016 is to curb the menace of pollution arising from the Bio-Medical Waste. The inclusion of different provisions is with a view to root out the problem in its entirety with finally disposing of it as per the Rules. The health care institutions are duty bound to follow the Rules for the proper and effective management and disposal of the waste. Out of all the processes, it is the disposal part which is considered as the most crucial because improper disposal of the waste would not only increase the pollution in the environment, it would also give rise to various other problems including some dreadful diseases. Therefore, all the health care institutions must incorporate in its policy, the steps required to be followed for the proper disposal of the Bio-Medical Waste. With a view to know the existing scenario of disposal in Government, private hospitals and in the nursing homes in Siliguri town, the researcher had given set of questions to the health care personnel to highlight on this issue. The following tables would help in understanding the disposal scenario in the health care institutions in Siliguri town.

9.12.1 Knowledge about the disposal scenario in the Government Hospitals

Table 7.1

Knowledge among the health care personnel relating to the method of disposal (pre and post) of Bio-Medical Waste

Knowledge on disposal of BMW	Administrative Officer (%)	Doctor (%)	Nurse (%)	House keeper-in-Charge (%)	Sweeper (%)	Lab.Tec-hnician (%)
Sterilisation	02 (100%)	07 (100%)	23 (91%)	00 (00%)	14 (29%)	01 (100%)
Shredding	02 (100%)	07 (100%)	23 (43%)	00 (00%)	14 (14%)	01 (100%)

Autoclaving	02 (100%)	07 (100%)	23 (83%)	00 (00%)	14 (43%)	01 (100%)
Microwaving	02 (100%)	07 (50%)	23 (35%)	00 (00%)	14 (14%)	01 (00%)
Common Bio-Medical Waste Treatment/In-cineration	02 (100%)	07 (100%)	23 (91%)	00 (00%)	14 (86%)	01 (100%)
Deep Burial	02 (100%)	07 (71%)	23 (09%)	00 (00%)	14 (21%)	01 (00%)
Effluent treatment plant	02 (100%)	07 (43%)	23 (00%)	00 (00%)	14 (00%)	01 (00%)

9.12.1.1 Situational analysis in the Government Hospitals

The following are the result of knowledge about the Bio-Medical Waste disposal scenario in the health care institutions in Siliguri:

1. In the Government hospitals, the administrative officers, who hold superior position in the hierarchy have 100% knowledge about the various disposal and its methods. But the doctors do not have 100% knowledge in microwaving, deep burial and effluent treatment system. The laboratory technician also falls in this category but regarding microwaving, deep burial and effluent treatment it is nil.
2. From the above data it is clear that a good percentage (91%) of nurses has knowledge in sterilisation. The same is very poor among the sweepers which are only 29%. Regarding shredding and microwaving the result is dissatisfactory to both categories of the health care personnel.
3. Almost all categories of the health care personnel have the knowledge about the common bio-medical waste treatment facilities.
4. Regarding deep burial and effluent treatment the knowledge among the health care personnel is very poor except the administrative officers. The doctors have poor knowledge (43%) regarding the same. Only 21% of the sweepers have knowledge about the deep burial and it is 00% in connection with the effluent treatment plant.

9.12.2 Knowledge about the disposal scenario in the Private Hospitals

Table 7.2

Knowledge among the health care personnel relating to the method of disposal (pre and post) of Bio-Medical Waste

Knowledge on disposal of BMW	Administrative Officer (%)	Doctor (%)	Nurse (%)	Housekeeper-in-Charge (%)	Sweeper (%)	Lab.Tec-hnician (%)
Sterilisation	04 (100%)	02 (100%)	14 (86%)	04 (100%)	06 (50%)	02 (100%)
Shredding	04 (100%)	02 (100%)	14 (36%)	04 (100%)	06 (17%)	02 (100%)
Autoclaving	04 (100%)	02 (100%)	14 (86%)	04 (100%)	06 (67%)	02 (100%)
Microwaving	04 (100%)	02 (100%)	14 (36%)	04 (100%)	06 (33%)	02 (50%)
Common Bio-Medical Waste Treatment/Incineration	04 (100%)	02 (100%)	14 (93%)	04 (100%)	06 (83%)	02 (100%)
Deep Burial	04 (100%)	02 (50%)	14 (14%)	04 (50%)	06 (07%)	02 (100%)
Effluent treatment plant	04 (100%)	02 (50%)	14 (00%)	04 (100%)	06 (00%)	02 (00%)

9.12.2.1 Situational analysis in the Private Hospitals

In order to understand the situation prevailing in the private hospitals in Siliguri town about the knowledge on the disposal aspect, the below referred information would help:

1. In the private hospitals in Siliguri the methods of disposal of the Bio-Medical Waste among the administrative authorities, doctors regarding sterilisation, autoclaving, microwaving, shredding and the common bio-medical waste treatment or incineration is well known except deep burial and effluent treatment which is 50% among the doctors.
2. The position among the nurses is more or less satisfactory regarding sterilisation, autoclaving and incineration. But they hold poor knowledge in microwaving, shredding and deep burial. On the other hand, their knowledge in the effluent treatment is nil.

- Among the sweepers, the knowledge of incineration is quite adequate. Only 50% of them know about the sterilisation. 67% among the sweepers know about the autoclaving. Regarding shredding, microwaving and deep burial they have poor knowledge which is 50%. They do not have any information about effluent treatment.

9.12.3 Knowledge about the disposal scenario in the Nursing Homes

Table 7.3

Knowledge among the health care personnel relating to the method of disposal (pre and post) of Bio-Medical Waste

Knowledge on disposal of BMW	Administrative Officer (%)	Doctor (%)	Nurse (%)	Housekeeper-in-Charge (%)	Sweeper (%)	Lab.Tec-hnician (%)
Sterilisation	06 (100%)	07 (100%)	28 (86%)	05 (100%)	12 (50%)	05 (100%)
Shredding	06 (100%)	07 (43%)	28 (32%)	05 (100%)	12 (17%)	05 (50%)
Autoclaving	06 (100%)	07 (100%)	28 (86%)	05 (100%)	12 (42%)	05 (80%)
Microwaving	06 (100%)	07 (50%)	28 (32%)	05 (80%)	12 (25%)	05 (50%)
Common Bio-Medical Waste Treatment/Incineration	06 (100%)	07 (100%)	28 (93%)	05 (100%)	12 (75%)	05 (80%)
Deep Burial	06 (100%)	07 (50%)	28 (07%)	05 (40%)	12 (17%)	05 (60%)
Effluent treatment plant	06 (100%)	07 (50%)	28 (00%)	05 (100%)	12 (00%)	05 (20%)

9.12.3.1 Situational analysis in the Nursing Homes

The situational analysis of the above data can be understood under the following manner:

- All the administrative officers under the study have 100% knowledge about the various methods of disposal of the Bio-Medical Waste. The scenario is not the same among the doctors and laboratory technician. It varies from one method to another. For example, the doctors have 100% knowledge about

some disposal method such as sterilisation, autoclaving and incineration but regarding shredding, deep burial and effluent they have lack of knowledge.

2. Only 40% of the house-keeper-in-charge knows about the deep burial. Regarding other disposal methods the percentage varies between 80% and 100%.
3. The position of nurses in the nursing homes in Siliguri is that they have good knowledge about sterilisation, autoclaving and incineration. On the other hand, the other methods of disposal such as microwaving, deep burial etc., the knowledge is very low.
4. The position of sweepers is no better. Except common bio-medical waste treatment or incineration, their knowledge in other methods of disposal is not satisfactory. The knowledge about sterilisation and autoclaving is better compare to the knowledge regarding other disposal methods which is 50% and 42% respectively.

9.13 A comparative study

From the above situational analysis it is found that in all the three categories of health care institutions in Siliguri most of the health care personnel falling in the category of the top most hierarchy as mentioned above, have quite a satisfactory knowledge on the various methods of the disposal of the Bio-Medical Waste. In all the category wise institutions these personnel possess sufficient knowledge for the proper disposal of the waste. In the contrast, the scenario is not the same with regard to the other category of the health care personnel, hierarchically who are in the lowest rank such as nurses and sweepers. It is interesting to note that the personnel who are actually involved in the disposal aspect suffer from lack of knowledge which would lead to the improper disposal of the same. The situation prevailing in the Government hospitals is much worse compare to the private hospitals and nursing homes. For example, the sweepers have less knowledge about the disposal methods against the sweepers engaged in other category of institutions. Therefore, it can be concluded that the Bio-Medical Waste disposal scenario is different in the Government and private health care institutions. In the private health care institution, the existing scenario is much better compare to the Government hospitals.

9.14 Quantity of Bio-Medical Waste generation and its disposal: Relationship

As it has already pointed out that the Bio-Medical Waste disposal is done by a single agency in Siliguri, namely Greenzen Bio Pvt. Ltd., the researcher was required to verify the capacity of the said agency and after visiting its factory located in Fulbari, within the District of Jalpaiguri it was found that the said agency has the incineration capacity of 15000 kg per day of particular categories of the Bio-Medical Wastes. This is important in the sense that if there is disparity between the quantity of waste generated and the incineration capacity, the whole disposal procedure would fail. The table below presents the existing per day Bio-Medical Waste generation in various health care institutions in Siliguri.

Table 8

Quantity of Bio-Medical Waste generated every day in the Health care institutions in Siliguri town

Category of the Health Care Institutions	Number of Beds in the Health care institutions	Average Per Day Generation of particular category of BMW (from yellow and blue bag)
Government Hospitals	1009	123 kg
Private Hospitals	0274	033 kg
Nursing Homes	1044	126 kg
Total	2327	282 kg

The above data shows that the health care institutions (37) in Siliguri town government as well as private, consisting of two thousand three hundred and twenty seven (2327) beds, generates a total of two hundred and eighty two (282) kg Bio-Medical Waste every day. This indicates that the incineration which is installed in Fulbari has sufficient capacity to incinerate. However, the incineration that has been installed by the agency is for the entire North Bengal region.

9.15 Assessment of practices on Bio-Medical Waste disposal in the health care institutions in the Siliguri Town

To understand the practices followed for the disposal of the Bio-Medical Waste the researcher had made several visits to the health care institutions with a view to present a correct scenario. Most of the visits were made during 10 AM to 2 PM in the first half because it is during this period the Bio-Medical Waste is collected from the bin and is primarily disposed in the storage area and from there the same is collected by the Greenzen Bio Pvt. In addition, sometimes surprise visit was also made during the second shift of working hours i.e. in the evening. The practices prevailing in the Government and private hospitals and the nursing homes in Siliguri town can be summarised as under:

9.15.1 Government Hospitals

In the North Bengal Medical College and Hospital and in Siliguri Sub-divisional Hospital it was seen that all kinds of wastes are collected in the bins but not in accordance with the Bio-Medical Waste Management Rules, 2016. Further, instead of keeping the same in the designated store, the same is thrown indiscriminately in the open field including the nearby road within the hospital compound. It was observed that only black, blue and yellow coloured plastic bags are used for all categories of Bio-medical Waste. Apart from this, aluminium/steel puncture proof containers covered with lid are used for needles, syringes etc. No red coloured plastic bags were found in any of such hospitals. It is to be noted here that red colour plastic bag has been introduced in the new Bio-Medical Waste Management Rules, 2016. This shows the lack of awareness among the Government health care personnel regarding the existing Rules. It was also seen that instead of proper segregation of the waste in designated colour bin, different category of wastes are mix improperly and the same is stored in the colour bin not meant for. General waste like food, paper etc. is thrown in the yellow bags instead of the black bin. Regarding the used needles, it was seen that the same was disposed off without recapping and this resulted in the needle stick injury to the sweepers which may be fatal if proper precautions are not taken. Further, the autoclave machines which are used for sterilisation are not functioning properly or it is non-functioning. The containers which is required to be filled three-fourth, are

full with the waste and sometimes it is overflowing and the waste, especially liquid waste has made the situation worse as it spill all over the floors creating air and eye pollution and there is every possibility of spreading deadly diseases from such waste containing infectious waste. During rainy season the situation get worst as the liquid waste after mixing up with the rain water spread all over thereby increases the chance of infectious diseases.

9.15.2 Private Hospitals and Nursing Homes

In the private health care institutions also the scenario about the use of different colour bags for different category of the Bio-Medical Waste is similar compare to the Government hospitals except in Neotia Getwell and Medica North Bengal Clinic. It was found that some private nursing homes such as Heritage Hospital, Sai Hospital, Siliguri Greater Lion Hospital, Siliguri Nursing Home, and Dr. Mohpal's Nursing Home do not have any storage area and the colour bins have been kept in the open area. Although in the private hospitals and nursing homes the practice of using colour bins are prevailing similar to that in the Government hospitals, however, the bins are covered with lid and it is only half filled. However, the management and disposal of the Bio-Medical Waste in such health care institutions are made with care and caution in a hygienic way using gloves, masks etc.. The floors are generally kept clean and is regularly mopped using disinfected. On interviewing it was found that the hospital administration usually provided with training intermittently.

It has been the practice in the private hospitals and nursing homes to use needle cutter, syringe destroyer to avoid needle prick injury. Further, it was found that the used sharps after it has been disinfected with hypochlorite (1%) solution are disposed off. This reduces the risk factor of needle stick injury and sharps related injury among the personnel who are especially involved in the disposal of the Bio-Medical Waste.

9.16 Final disposal of the Bio-Medical Waste by the Greenzen Bio Pvt. Ltd. at Fulbari, Jalpaiguri

Regarding the disposal of the Bio-Medical Waste, all the health care institutions in the Siliguri town are tied up with a private agency namely, Greezen Bio Pvt. Ltd. for the removal and disposal of the same. This agency is involved in various activities right from the primary collection till the permanent disposal of the Bio-Medical Waste. This is the only company for the entire North Bengal region which is involved in the whole aspect of disposal. The company has three waste vans for the Siliguri, Matigara and Khoribari for collecting the waste from all the health care institutions in this area. After collecting it the same is either incinerated or autoclaved. There is one incinerator, one non-functioning autoclave and one shredder set up in the factory. It was seen that different persons were engaged in the segregation of different types of Bio-Medical Waste. Most of them persons were without masks and proper foot wear. After segregation the same is stored in different bins with a view either to sent the same for shredding or autoclaving. Items like saline bottles, catheters etc. are sent for recycling. The glass waste is shredded and the dust is stored in plastic sacks to be used for manufacturing the glass items. On visiting the site the researcher found that the whole factory compound is fully air polluted as the bad and filthy odour is coming from the deposited waste collected for several days but yet not incinerated.

Further, there is one blower machine installed in the factory which is used to disinfect the incinerated ash to reduce air pollution in the surrounding areas. The researcher had found that although the incineration machine was in operation but the blower was not functioning. On asking the same was put in operation and it was found that instead of black fumes, it was removing clear fumes from the chimney. Due to such careless attitude on the part of the person involved it is creating pollution in the nearby areas. This careless attitude of the Greenzen resulted in the institution of a suit against the Greenzen in the Jalpaiguri Court seeking relief to close down the same on the ground of air pollution. An instance of such careless attitude on the part of the Greenzen can also be found in collecting the Bio-Medical Waste. Instead of daily collection they collect it irregularly, sometimes after two to three days which increases the risk of spreading infection in the health care institutions located in the Siliguri town.

Apart from the collection and incineration, the company also supplies all types of colour bags, red, blue and yellow to the entire health care institutions in North Bengal. The colour bag is stamped with bar code and is distributed among the different health care institutions. The aim of providing with the bar code is to identify the health care institution who are involve in mixing the general waste with the particular type of Bio-Medical Waste and to take necessary steps to avoid the same. While interviewing the person who is the in-charge of the factory disclosed that many a time it was found that the health care personnel employed in the Government hospitals has such type of tendency. On asking what steps they usually takes in order to prevent it, he said that the same is incinerated. Regarding the use of colour bags as per the Rules, he replied that usually they supply all types of colour bag except the red colour bag which is being supplied on demand. According to him, only two nursing homes i.e. Neotia Getwell and Medica North Bengal Clinic uses red colour bag.

9.17 An Overview

From the above discussion it can be concluded that a wide difference exists between the perception and practices for the management of the Bio-Medical Waste both in the Government and private health care institutions. Although, the practices followed in the private health care institution is better compare to the Government health care institution, still much has to be done to improve the condition for the proper management and disposal of the Bio-Medical Waste. There is an urgent need to improve the condition prevailing in the Government health care institution in order to maintain a balance for the wholesome development on the aspect of the management of the Bio-Medical Waste. Improvement of the condition in the private health care institutions only without improving the waste management situation in the Government hospitals would be futile as nothing can be achieved and the whole Bio-Medical Waste disposal scenario would remain unchanged. To overcome it the necessity is to find out the appropriate steps by strict application of which the situation would be changed. What different steps could be adopted which would help in improving the existing scenario relating to the Bio-Medical Waste has been discussed in the concluding chapter.

CHAPTER X

CONCLUSION AND RECOMMENDATIONS

The problem of Bio-Medical Waste disposal has acquired monumental proportions today and is receiving attention all over as it has link with the public health and the environment and there is a commitment to safeguard the both from the physical and social impacts associated with it. Everyday the country's numerous health care institutions produces millions of tones of the most diverse and difficult to manage waste i.e. the Bio-Medical Waste. An alarming percentage of the waste litters within and outside of the health care institutions, especially in the Government health care institutions and has turned the place into a breeding grounds of lethal virulence and epidemics as pigs and dogs sniffing at and digging their faces into piles of garbage and heaps of infectious material lying within the health care compound. Likewise, the rag pickers are also engaged in collecting the infectious and other waste according to their requirements and thereby causing serious threat not only to the public health but to the environment as well. From paper scrap to cardboard boxes, from plastic bottles of intravenous bags and catheters, from batteries to broken thermometers, from used bandages to blood soaked surgical gowns, the Bio-Medical Waste of all categories can be found littering inside and outside of the health care institutions throughout the country.

It is very surprising that where on the one hand huge investment is made in constructing large and well equipped health care institutions on the other, little thought is given in dealing with the Bio-Medical Waste generated in it. Management of Bio-Medical Waste in a health care institution should be based on a scientific approach to the process of waste generation, storage, transport, treatment and its disposal. It is out of mention to say that the waste should be managed in an environmentally safe manner and this is possible only if the health care personnel have proper knowledge of risks management associated with the handling of such waste.

A lot has been said but little is done towards the management of the Bio-Medical Waste in our country. Health care institutions, which on the one hand plays an important role in preventing the proliferation of disease and valuable human lives,

on the other it has the potential to pollute the environment if infectious Bio-Medical Waste generated by them is not properly treated and subsequently disposed of. Although the Notification of the Bio-Medical Waste (Management & Handling) Rules, 1998 was issued by the Ministry of Environment and Forests, Government of India to regulate and manage the hospital generated waste and was in force till 2016 when the new Bio-Medical Waste Management Rules, 2016 came into force in the country to overcome the lacunae that was existed under the old Rules, the health care institutions all over the country are yet to react to it seriously to the safe and rational management of the Bio-medical Waste.

Therefore, taking into consideration the seriousness of the problem persisted in the management of the Bio-Medical Waste throughout the country and to examine the efficacy of the existing Rules, the researcher has undertaken the subject with several objectives in hand which includes among others, detailed in-depth knowledge about the existing Bio-Medical Waste scenario prevailing in the country, its evolution by tracing out the past history, international documents (general and specific) to deal with the same, general and particular laws of the country under which the subject could be properly dealt with, the existing scenario of Bio-Medical Waste in developed countries like USA, UK, China etc. On the basis voluminous data, primary and secondary, the researcher had tried to reach to the findings with relevant remarks under this work. The chapterisations of this research work is based on the hypothesis that whether the health care institutions are discharging its duties properly or in gross violation of the existing Rules or there is lacunae in the Rules itself making the situation difficult to manage.

Another object of this research work was to highlight on the practices prevailing in Siliguri town regarding the disposal of the Bio-Medical Waste in accordance with the Rules for which the researcher had undertook to conduct field study as part of the empirical research and it has been found that the scenario in the Siliguri town is more or less similar to that prevailing in the other health care institutions in the country. Being the primary aim, the researcher had visited different health care institutions located in Siliguri, questioned and interviewed different health care personnel. A glimpse of the chapter dealing with the empirical study shows a very grim picture of the city in disposing off the Bio-Medical Waste, whether it is in the Government hospitals, or in the private hospitals and nursing homes. It has been

seen that despite having the Rules, in tune of the practices prevailing in other parts of the country, the city is also not an exception in this regard. It should be mentioned here that the existing situation in the Government health care institutions in the city is worse compare to the private health care institutions.

In this background, where the Bio-Medical Waste management all over the country including Siliguri town portray the similar picture, there is an urgent need to develop a framework within which progress can be made on a step by step basis which shall foster the philosophy that any small but steady step of improvement is better than doing nothing. The framework can be compared with a ladder where each stair is a detailed plan of action that aims to accomplish a goal and provides the basis for moving up to the next level, leading ultimately to the establishment of a sound in-house management programme at the top. To achieve the same strict implementation of the following must be ensure and then only instead of being only in the paper disposal of the Bio-Medical Waste would be practically and effectively possible.

RECOMMENDATIONS

Therefore, every health care institution should begin with the following:

1. The policy guidelines

The policy provides a framework within which the management of the Bio-Medical Waste is to be operated. If the framework is not well conceived, the tasks of those concerned with the management of the Bio-Medical Waste would be very difficult. The policy makers should also provide support and guidance to the concerned persons involved in the management. Bio-Medical Waste guidelines are intended to provide an approach to the management, for management of the waste that is safe for the waste handlers, the public and the environment. To ensure effective management of the Bio-Medical Waste every health care institution must prepare a policy guideline with an assured implementation scheme. The policy must be compiled taking into consideration various polices, national and international relating to the management of the Bio-Medical Waste. This depends, of course, on the financial capacity each health care institutions has. For the proper and effective implementation of the policy it is essential to establish a Management Cell whose task would be to prepare an integrated master plan regarding training and education with

more emphasise on practical training, priority on the maintenance of hygiene and cleanliness apart from the strict follow up of the existing Rules in terms of collection, segregation, storage, transportation and final disposal. Depending on the financial capacity, the policy should incorporate the plan for the purchase of modern developed equipments with environmentally sound and cost effective criteria to provide riskless and injury less handling of the Bio-Medical Waste.

2. Bio-Medical Waste management cell

A separate wing, called Bio-Medical Waste Management Cell can be set up for each of the health care institution, which would maintain an inventory of waste generated ward wise and the quantum sent for treatment and disposal. The health care institutions should establish a Bio-Medical Waste Management Committee and appoint a Management representative who will be directly responsible for establishing systems and procedures, implementing and maintaining the systems and assisted by a team of adequately trained staff. The members of the Committee should include representatives from the various departments including the nursing and house-keeping staffs. The management cell should frame a waste management strategy to ensure that all relevant regulatory requirements are fulfilled. The strategy should clearly outline management commitment

- a. To the principle of responsible waste management;
- b. In term of resource allocation;
- c. Highlight the accountabilities and responsibilities of management, staff and contractors;
- d. Clearly define the various categories of the waste stream; clearly articulate appropriate disposal procedures and
- e. Provide adequate and ongoing education

Strict compliance of the strategy by each and every health care personnel involved in the management of the Bio-Medical Waste is the most essential function of the head of the Management. The making of policies and setting up of the Management Committee would be futile if the strategies are not successfully implemented. The Committee should decide that steps to be taken against those who has shown casual attitude towards the proper implementation of the Bio-Medical Waste.

3. Bio-Medical Waste management action plan

The health care institutions should develop a plan, an action plan, to give effect of its Bio-Medical Waste Management Policy. The members of the Bio-Medical Waste Management Committee should begin by conducting a survey for understanding the entire systems in each functional area and should prepare a document in this connection. The document should cover the following aspects:

1. Roles and responsibilities of each staff engaged;
2. Type and quantity of waste generated in each functional area.
3. Description of existing methodology practices under each activity such as segregation, internal and external transportation, pre-treatment, storage, post treatment and final disposal of the waste generated in various units.
4. One should cross check whether the activities are adequate as per standard practices.
5. Existing methodology should be modified appropriately, consistent with the type, quantity and frequency of waste generated in each unit.

The action plan should lay the standard operating procedures covering all components and modes of handling the waste. The first step would be to identify the procedures for the management of entire waste right from the collection, segregation to transportation and disposal. The head of the particular ward/unit who has given the charge of managing the Bio-Medical Waste in that ward/unit should be properly educated and trained under whose guidance the waste is to be handled with proper care and caution. Each ward/unit should have an identified collection point with the displayed instructions to attract the attention of the persons involved in the handling of the waste. The person must have a vigilant eye over the entire process especially those involved in segregation process because improper segregation would make the entire waste management process in jeopardy and all the effort would go in vain. Only trained and experienced sweepers should be engaged in this process. Such personnel may be assisted by the not-so-trained sweepers who not only would obtain the practical knowledge, in the course of time, they would become a trained and experienced waste handler and the risk factor in the primary stage would be completely reduced to nil. It should be remembered that the location of the primary storage should essentially be nearby the treatment area. The hygiene of the primary

storage area should be maintained by using the disinfectant and it should also be inaccessible to animals, insects etc.

For carrying the waste bags from the source of generation to primary storage area help of three/four wheeled trolley with sufficient storage capacity should be used. The trollies should be regularly cleaned and dried up after every use. At the time of carrying the infectious waste special care should be taken so that no spillage should be leaked. While loading the waste bags proper care should be taken so that the risk factor of injury could be minimised. The collected waste should not be left over inside or outside the ward/unit even for a temporary period, other than the central storage. It should be ensure by the head of the unit/ward that while handling the waste proper precaution and safety guards like gloves, masks, apron, gumboots etc. has been followed.

The method of cross-checking after following each step in the entire system of Bio-Medical Waste management is considered as an effective step and if the same is implemented, the risk factor would be nil. The head of the ward/unit may be held responsible to the higher authority for not discharging the duty of cross-checking on a regular basis. The existing methodology may vary from time to time depending on the situation keeping in view the ultimate aim of managing the waste in a scientific way.

4. Ensuring infection control practices

Infection control refers to policies and procedures used to minimise the risk of spreading infections in the health care institutions. The control of infection in the health care institution is the responsibility of all health care personnel. The hospital acquired infections known as nosocomial infections requires a hygienic and sanitised environment and maintenance of good practices and use of protective gear. Routine cleaning of every ward is absolutely essential, as that will keep the environment free from dust and soil. Infection control practices can be grouped in two categories:

- a. Standard precautions: To be applied to each and every patient at all times, regardless of his diagnosis or infectious status. This includes hand-washing and antisepsis, use of appropriate personal protective equipment while handling organs, blood, body substance etc.

- b. Additional precautions: These are infection control precautions specific to modes of transmission such as airborne, droplet and contact and are applied in addition to standard precautions, wherever necessary.

Many a times it has been seen that despite the availability of the protective equipments, due to lack of education and training the handlers of Bio-Medical Waste are careless in wearing the same and the consequent result is the spreading and contacting of infection to those handlers including the patients, the visitors, the nurses and all who are directly or indirectly connected with it. To stop the same the head of every ward/unit should be careful and should see whether protective measures have been followed. In addition to it, such person should also see whether appropriate protective equipment has chosen depending on the risk of exposure of certain type of Bio-Medical Waste, *e.g.* sharps waste. Sharps should be disinfected or destroyed as per the policy guidelines of the health care institutions. The health care institution, as far as possible, should make arrangement of the sharp handling devices to avoid injury to the user and to others who may come into contact with the sharp items.

5. Proper Education and Training

The purpose of education and training is to minimise the risk of the injury associated with the waste handling and facilitate efficient waste management. The authority of the health care institution must provide education and training to the following personnel:

- a. Waste generators;
- b. Waste handlers, collectors and transporters;
- c. Key managers instrumental in the implementation of the waste management plan; and
- d. Operators responsible for treatment and disposal methods.

Training of the health care personnel is an important aspect for a successful Bio-Medical Waste management programme. Training will provide orientation for new as well as existing health care personnel with new responsibilities and help in continual updates as the policy changes. It has been seen that the segregation and handling of Bio-Medical Waste is carried out to a large extent by the health care personnel without adequate training. Training should focus on all principles relating

to the management of the waste. The training module may be divided into five categories, with each category linked to one of the five main categories of the training programme. Such modules are:

- a. Introduction to Bio-Medical Waste problems,
- b. Development of a strategic approach,
- c. Policy development and programme planning,
- d. Planning at health care facilities level and
- e. Strategic planning at the local health care level.

Regular training of the health care personnel would increase awareness among them. The training should be made mandatory for all the health care institutions. At the same time, Bio-Medical Waste related education materials both in printed and electronic format like posters, books, booklets, films, videos slides is to be prepared. Audio-video screening sessions, field visits, situation analysis, problem solving, informal interactions along with the module based training should be incorporated in training programme.

It has been seen that in many health care institutions the health care personnel are involved in the management of the Bio-Medical Waste without proper training and without having knowledge about how to handle it. In-house training of health care personnel should be made mandatory for each health care institution which would help in the proper management of the waste. In addition to this, the health care personnel should attend the training programme conducted either by the concerned department of the Government or any other private organisations. The benefit of attending such training programme is that the health care personnel would be well versed with latest methodology of the waste management. It has been seen that despite having proper training and education due to lack of infrastructure in the health care institutions the management of waste could not be possible as per the developed and scientific way of management that has been newly introduced. Therefore, the health care institutions should make arrangement of all those equipments the availability of which would help the health care personnel to act in accordance with the trained knowledge.

6. Emphasis on Bio-Medical Waste Audit

Waste audit is an important step in the management of the Bio-Medical Waste because the success of the entire waste management depends on it. The purpose of the waste audit is to determine current performance in terms of safety, efficiency, environmental impact assessment, costs and regulatory compliance. The following information should be collected and assessed in accordance with the guidelines:

- a. Types, volume and/or weight, quantities and composition of waste generated;
- b. Hazard assessment of waste;
- c. Incidence and severity of waste handling injuries;
- d. Incidence and nature of spills and leakages;
- e. Sources of solid and liquid waste;
- f. In-house procedures or processes producing waste;
- g. Points of generation, collection and storage sites;
- h. Contents of waste containers;
- i. Loading, transport and disposal methods;
- j. Transportation records and waste dockets;
- k. Costs of disposable versus reusable items; and
- l. Costs of waste packaging, internal and external transport, treatment and disposal.

The policy guidelines of every health care institution should include in their respective policy the matter relating to the waste audit. It has been found that although the policy guidelines provides for the same, however due to its non-implementation, the situation remains the same. In order to achieve the goal of effective management of the Bio-Medical Waste, the health care institutions should make periodical assessment under the supervision of a responsible trained person. The audit would help in identifying the areas where there is lack of proper management and after detecting it, appropriate corrective measures can be taken to remove the defects. Regular waste audit is an important aspect in the management of the Bio-Medical Waste identifying the most negligible area *i.e.* any ward or department within the health care institutions and accordingly appropriate steps could be taken to overcome it. It would also help in identifying the persons for whose negligent and careless act

made the situation worse and thereby appropriate departmental steps can be taken against them.

7. Need for Waste minimisation

It is the duty of the authorities of every health care institution to identify and quantify the waste generation. Effective measures should be adopted to reduce the amount of waste by controlling the demand/inventory, wastage of consumable items and breakages, etc. Another option is recycling of certain wastes such as paper, glassware, plastic material, etc. after proper cleaning and disinfection.

As far as possible, healthcare establishments should encourage purchase of reusable items made of glass and metal. Meticulous segregation is the key to minimise the quantity of waste to be treated. Waste minimisation can save health care institutions a great deal of money in the long run. Waste can be minimised by the following methods:

- a. Source reduction: It can be made possible through product substitution, technology change and good operation practices. This includes less wastage of products, autoclaving instead of chemical disinfection, and selection of the items that are less wasteful and less hazardous.
- b. Recovery and recycling: Recovery can be possible by converting the waste products into new products encompassing recycling of the Bio-Medical Waste. The concept of recycling of some Bio-Medical Waste gaining popularity in some health care institutions for non-hazardous category of waste. It can reduce the cost considerably and can also generate revenues either through reduced disposal costs or through payments made by the recycling agencies.
- c. Reuse: Few Bio-Medical Wastes can be reuse which in turn can minimise the volume of costly waste disposal streams, though a high standard of patient care and worker safety may preclude reuse of some items. Health care institutions should critically examine current waste streams and determine what products can be separate out at the point of generation to be effectively reused.
- d. Composting organic waste: Composting is a type of recycling organic waste such as vegetable food scraps matter to produce compost or soil conditioner to be used in the agriculture or other similar purposes.

An effective Bio-Medical Waste management plan along with proper training make to possible to minimise the waste considerably. This can be done in the following ways:

- a. Development and proper implementation in the product purchasing policy. It includes the technique of selecting the product which are less hazardous;
- b. Development and implementation of product substitution policy which can often lead to cost-effective solutions.
- c. Where substitution cannot be achieved due to a limited range of products, management should approach the suppliers to change the product *e.g.* change from solvent-based products to water-based or from lead-based paints to less hazardous alternatives;
- d. Choosing of cost-effective items with minimum possible use for the treatment of the patients would reduce the wastage of items;
- e. Reusable items should be preferred to disposable items whenever it is clinically appropriate, environmentally sound and practical to do so.

8. Ensuring occupational safety and health issues

Bio-Medical Waste treatment and disposal system pose a very wide variety of health and safety hazards for the handlers and other waste management personnel. Many systems have the potential to release toxic materials into the workplace, excessive amounts of heat to the area and produce high levels of noise. This system can physically harm the personnel through accidents. Only by way of developing a detailed health and safety plan and diligent follow-up monitoring, can workers be protected against these hazards.

Of course, the best method for protecting the health care personnel is to eliminate the danger as far as possible. Where it is not possible, they should be provided with personal protective equipment to minimise exposure. It should be noted that the inappropriate selection of this equipment can cause over exposure, illness, or even death of the persons involved in the handling and management of the Bio-Medical Waste. With the help of proper and adequate training the health care personnel should be educated and awareness should be raised to wear gumboots, hand gloves, eye cover etc. and if they work without following the same, they may expose themselves to injuries with sharps and needles.

In addition to this, in every health care institution a sharps management system should be developed because the potential infections can be caused from specific categories of hazardous Bio-Medical Wastes, especially from sharps. The development of sharps management system could maintain occupational safety and health of the health care personnel handling the same. The process of secured segregation and collection would also help in the maintenance of occupational safety of the health care personnel.

9. Adoption of new technologies for the treatment of the Bio-Medical Waste

Alternative medical waste treatment technologies have attracted the attention of a great amount of research and development activities over the last many years. Treatment by various technologies provides the mechanism to reduce or eliminate the number of pathogens, thereby minimising or eliminating the potential for disease transmission or microbial destruction required of any Bio-Medical waste treatment process.

Health care institutions are often faced with the difficulty of selecting the right technology for treatment and disposal of Bio-Medical Waste. No single technology is ideal for all kinds of waste and all scales of operation. There is a range of methods available to treat and dispose of such wastes. Any treatment option for the specific types of waste should fulfil the following:

1. Render sharps incapable of causing penetration injury;
2. Render the waste unrecongnisable;
3. Achieve a significant volume reduction;
4. Result in minimum levels of hazardous or toxic by-products;
5. Reduce the potential for the transmission of infection;
6. Have continuous automatic monitoring and recording;
7. Meet occupational health and safety standards;
8. Provide pre-treatment refrigerated storage facilities; and
9. In the case of autoclaves, be tested at least annually to ensure that optimal performance is maintained.

Such technology can be classified into the following three categories:

1. Soft Technologies;

2. Hard Technologies; and
3. Other Technologies.

Under the soft technologies cleaning devices such as brooms, mops, storage devices like dust bins, temporary sheds or storage device, handling devices like dust pans, trolleys, etc. could be used. This also includes chemical treatment devices with a view to destroy micro-organisms such as using of hypochlorite solution, chloramines, iodine, formaline, ethylene oxide gas etc. Personal safety devices, for example, gloves boots, eye glasses, masks, aprons etc. are the protective gears should be made mandatory for all the personnel handling the waste.

The hard technologies includes among other needle cutter, syringe destroyers, shredders, boiling water sterilisers, autoclaves, microwaves, incinerators, gas sterilisation, irradiation, plasma pyrolysis, etc. The installation of these machineries should be made mandatory for every health care institutions, at the same time this is to be ensured that such equipments should function properly and in case the same is non-functioning, effective measures should be taken immediately.

Proper care must be taken while using the hard technologies especially incinerators because many a time it has been seen that the disposal of Bio-Medical Waste through incineration recreate pollution as the emission it dispersed causes air pollution without reducing the pollutant present in it. The use of blower is an effective measure that helps in reducing the pollutant and it has to be ensured that at the time of incineration the blower machine should function properly.

Other technologies includes safe pits for sharps, landfill etc. In order to minimise the cost burial in safe pit is an effective and economical methods but the pits should be properly designed and constructed. Apart from the safe pits, landfill is another method for final disposal of Bio-Medical Waste. It is a traditional disposal method which is not free from danger. Because leaching can contaminate ground water or people or animals can access the area which is dangerous. However, if the Bio-Medical Waste is properly segregated than most of the non-infectious waste can be disposed of by landfill in the designated site which must be declared as restricted area.

The management of the health care institutions should adopt and follow the most practicable technologies to the extent of its financial capacity and should have willingness to install those technologies because many a time it has been seen that although the particular institution has the capacity to install the modern technology but due to lack of interest or carelessness or callousness the same remain unaffected. Therefore, it should be made mandatory for all the health care institution to implement developed technologies with the change in the nature of Bio-Medical Waste with a view to reduce the risk factor involved in it. In addition to this, a record is to be maintained by the head of the every ward/unit where such technologies have been set up and it should be monitored on a regular basis by the same person to keep updated whether such equipments are functioning properly.

Besides, the adoption of Radio Frequency Identification (RFID) technology (as followed in China) would help in preventing new-born babies from getting mixed up in hospitals. Employing medical waste monitoring systems to manage medical wastes are new weapons that are quietly changing the management of modern hospitals which if adopted and followed in Indian health care institutions would help in changing the Bio-Medical Waste management scenario effectively. Further, All nursing stations should equipped with RFID devices to complete the transfer of waste between nurses and transportation staff. Medical waste transfer stations are equipped with PC terminals, electronic scales, barcode scanning guns, RFID devices and printers to complete the weighing and transfer of medical waste. To avoid cross contamination, non-contact identification technology is adopted.

10. The need for the installation of reprocessing technologies

To encourage the concept of reuse and recycling of some categories of the Bio-Medical Waste there is an urgent need for the installation of reprocessing technologies within the compound of the health care institutions. The effect of installation of reprocessing technologies would reduce the tendency of disposing of the waste which is an expensive practice followed everywhere. Although, initially it may affect the budget of the health care institutions, however, in the long run, apart from the successful cost reduction, it would create employment as more people would be required to be engaged in the recycling or reuse process.

11. Role of the Pollution Control Board

Although the concern department of the Government has been doing its job but due to the lethargic attitude of the employees the proper management of the Bio-Medical Waste is still at sea. Still there is a need to re-view the practices followed in the various health care institutions of the country because with the tremendous growth of this industry, it is expected that more and more waste will be generated, consequently, it give rise to the need of proper treatment and disposal of the same and if the same attitude of the Government employees persists, the situation would be dangerous. Therefore, within the framework of the Rules the concern officers should show a vigorous approach with strict attitude in discharging their duties towards the management of the Bio-Medical Waste. This is possible if the concerned person make surprise visit in the health care institution and if it finds any violation, it may cancel the authorisation to run the same. Such department may also direct the private agencies engaging in the disposal activity to submit periodic report regarding the incineration, shredding, autoclaving, microwaving etc. and it can be cross checked by making surprise visit of the place where disposal process is being carried out.

12. Provision for Penalty

Under the existing Bio-Medical Waste Management Rules, 2016, no specific provision has been made on punishment for infringing the Rules instead the violator is subject to punishment under Section 15 of the Environment Protection Act, 1986 the maximum of which extends to seven years. It is to be noted here that in USA the Pollution Control Board, an enforcement machinery have been conferred with the power to enter into the place of generation as well as disposal of the Bio-Medical Waste site at reasonable times to inspect the premises and obtain the samples of medical waste. If it is found that there is a gross violation of the laws, the occupiers would be liable to strict civil penalty by paying fine of exemplary amount in order to prevent further violation the purpose of such high fines is with a view to send the message that it is more expensive to pollute than to legally dispose of the waste. Further, the Pollution Control Board may also be conferred with the power under the law to criminal penalties by sending the violators to the jail which is also based on deterrent theory of punishment.

There is no denying the fact that some of the recommendations mentioned above have been already following by most of the health care institutions because they are the basis which are universally applicable in every health care institutions throughout the world for the management and disposal of the Bio-Medical Waste. This includes framing of policy, establishment of management cell, training and educating of the health care personnel engaged in the whole management aspect etc. With a positive vigour and attitude it should be successfully implemented and to make it successful the steps which have been recommended under each head of recommendation is strictly to be followed. It has been seen that due to careless and lethargic attitude among most of the health care personnel the basic framework for the management of the Bio-Medical Waste failed in its root level. This attitude could be change if the concern authority i.e. the pollution control board changes its perception towards the same. The coordination between the health care institutions and the concern authority with positive attitude would make it possible in the successful disposal of the Bio-Medical Waste. Therefore, the widely accepted old philosophy 'better late than never' can be appropriately applied in this connection considering its ill-effect on the human health and the environment which is the need of the hour.

QUESTIONNAIRE

Tick the appropriate answer:

Your position:

Doctor/Dentist Class IV employee Nurse Lab technician

Duration of working in the hospital

1-5 Years 6-10 Years 11-15 Years 16-20 Years

Knowledge of biomedical (BM) waste generation, hazards and legislation

1. Do you know about BM waste generation and legislation?
 Yes No Not sure
2. What agency(s) regulate(s) wastes generated at health care facilities?
 State Private Do not know
3. Do you think it is important to know about BM waste generation, hazards and legislation?
 Yes No Somewhat
4. Biomedical Waste (Management & Handling) Rules were first proposed in:
 1997 1998 2000 2016
5. What is the quantum of waste generated by the hospital?
 Kg./Tons
6. According to the Biomedical Waste (Management & Handling) Rules, waste should not be stored beyond:
 12 hours 48 hours 72 hours 96 hours
7. Do you have any knowledge regarding what type of waste is produced and in which areas?
 Yes No Cannot say
8. Is the waste handler using protective clothing?
 Yes No Cannot Comment
9. What safety measures have been provided by the Hospital Authorities?
 Universal Precautions Gloves and Masks Any other
10. Are you aware that biomedical waste is hazardous to human health?
 Yes No No Comment

Level of awareness on biomedical waste management practice

11. Do you know about biomedical waste management in your hospital?
 Yes No No comment
12. Have you had any training in Biomedical waste management?
 Yes No No Idea
13. Do you agree that biomedical wastes should be segregated into different categories
 Yes No Don't Know
14. Do you know about colour-coding segregation of Bio-Medical waste?
 Yes No Not sure
15. Do you follow colour-coding for BM waste?
 Yes No Sometimes
16. Is the waste disposal practice correct in your hospital?
 Yes No Cannot comment
17. Objects that may be capable of causing punctures or cuts, that may have been exposed to blood or body fluids including scalpels, needles, glass ampoules, test tubes and slides, are considered biomedical waste. How should these objects be disposed of?
 Black bags Yellow bags Clear bags Sharps container
18. Which bag is used for the general waste?
 Black Yellow Blue
19. The colour code for the BM waste to be autoclaved, disinfected is:
 Red Black Yellow Blue/white
20. The approximate proportion of infectious waste among total waste generated from a health care facility is:
 10-20% 30-40% 50-60% 80-90%
21. Do you know the colour bag use for anatomical waste?
 Red Black Yellow Blue

22. All of the following statements about hazardous waste containers are true, except for:

- Containers must be closed except when removing or adding waste.
- Containers must be clean outside.
- Contents must be compatible with the type of waste containers.
- Any type of container, including food containers, can be used to contain hazardous waste.

Method of Disposal of BMW

23. Do you think that infectious waste should be sterilised from infections by autoclaving before shredding and disposal?

- Yes No Don't know

24. What are the methods used to dispose off Bio-Medical Waste by the Hospital Authorities?

- Self Disposal method Through CBWTF No Treatment adopted

25. Do You Have Storage Facilities?

- Yes No No Idea

26. What kind of precautions is taken to handle and dispose of Bio-Medical Waste in your hospital?

- Universal Precautions Gloves, mask, apron and foot wears No safety measures

27. Do you have any autoclave machine installed in this hospital?

- Yes No Don't Know

29. Do the hospital has microwave machine?

- Yes No Don't know

30. What is the treatment adopted to treat biomedical waste?

- Incineration and deep burial pits To CBMWTF

Thank you for your valuable time and cooperation.

List of Cases

A

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4. *A.P. Pollution Control Board v. Prof. M. V. Nayudu*, AIR 1999 SC 812.
5. *Attorney General v. Corporation of Nottingham*, (1904) 7 Ch 673.
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7. *Bangalore Medical Trust v. B.S Muddappa*, (1991) 4 SCC 54.
8. *Bijayananda Patra v. District Magistrate, Cuttack*, AIR 2000 Ori 70.
9. *Burrabazar Fire Works Dealers Association and Ors. v. The Commissioner of Police and Ors.*, AIR1998 Cal 21.

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10. *CESC Ltd. v. Subhash Chandra Bose*, AIR 1992 SC 573.
11. *Charan Lal Sahu v. Union of India*, AIR 1990 SC 1480.
12. *Consumer Education and Research Centre v. Union of India*, AIR 1995 SC 922.
13. *Cooverjee B. Bharucha v. Excise commissioner, Ajmer*, AIR 1954 SC 220.

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14. *Delhi Medical Association v. Union of India*, AIR 2009 Delhi 163.
15. *Deshi Sugar Mill v. Tupsi Kahar*, AIR 1926 Pat 506.
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POTENTIAL IMPLICATIONS OF BIO-MEDICAL WASTE IN INDIA : A STUDY

*Dipankar Debnath**

INTRODUCTION

The hospitals and health centres are considered as a part of social organization which is intended to meet the medico-social needs of the community. Through the process of evolution the hospital environments has gone a tremendous changes. In this process where, on the one hand hospitals are providing for the best opportunities for learning about health, on the other, it poses a threat on the health of the community as a whole due to the waste generated from such institutions. Waste generation in hospitals and their disposal have been an increasing cause of concern ever since the hospitals and Nursing Homes came into existence as Health Business. The apparent risks of undisposed biomedical wastes not only causes occupational health hazards to doctors, nurses and other staffs, patients and their attendants but also is a major cause for environmental hazards and therefore, the consequences of such wastes is not confined within the sphere of health care institutions alone but spills over to other civic and statutory authorities.

The concern for bio-medical waste management has been felt globally with the rise in infectious diseases due to indiscriminate disposal of waste. Prior to bio medical waste rules, the wastes was considered as ordinary waste and was treated and disposed of with the municipal wastes most of which are solid in nature. A modern hospital is a complex, multidisciplinary system which consumes thousands of items for delivery of medical care and is a part of physical environment. All these products consumed in the hospital leave some unusable leftovers i.e. hospital waste. The last century witnessed the rapid mushrooming of hospital in the public and private sector, dictated by the needs of expanding population, consequently it resulted in the generation of waste which is according to World Health Organisation (WHO) much more higher than three decades ago.¹

HISTORY OF HOSPITAL WASTE MANAGEMENT IN INDIA

The hospital waste like body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster casts from infected and contaminated areas are very essential to be properly collected, segregated, stored, transported, treated and disposed of in safe manner to prevent nosocomial or hospital acquired infection. Various communicable diseases, which spread through water, sweat, blood, body fluids and contaminated organs, are important to be prevented.² In India the seriousness about

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1 Agarwal, Ravi.: Halls of healing, dens of decay-Intervention, The Times of India, 2000.

2 Khan Mohd Faisal. Hospital Waste Management: Principles and Guidelines, Kanishka. 2007

the management came into lime light only after 1990s. The problem of bio-medical waste has acquired gargantuan proportions and complex dimensions in recent years. With increased use of disposable material and the presence of dreaded disease like Hepatitis - B and AIDS, it is utmost important to take care of the infected and hazardous waste to save the mankind from disaster. World wide as per the World Health Organisation (WHO) 8-16 million hepatitis B, 2.3 to 4.7 millions hepatitis C and 80000 to 160000 HIV infections are estimated to occur from the re-use of syringe needle without sterilization.³

In view of the risk present in such waste and also to ensure India's international obligation shouldered in Basel Convention to implement its directives relating to hospital waste, the Government of India in exercise of powers conferred by Sections 6, 8 and 25 of the Environment (Protection) Act, 1986 formulated the Bio Medical (Handling & Management) Rules, 1998. It may be pointed out here that the Rule does not say anything about the extent to which it shall be applicable. It seems that the Rule got strength from Sec. 1(2) of the Environment (Protection) Act, 1986 wherein it is mentioned that the Act shall extend to the whole of India or further notification is required. The Rule should be drafted in clear terms so as to avoid future disputes regarding its applicability.

Two other amendments have come through since. The first amendment notified on March 6th 2000 is referred to as Bio-Medical Waste (Management & Handling) (Amendment) Rules 2000. This amendment only changed Schedule VI of the rules, concerning having waste management facilities for treatment of waste. Even when the first deadline for eight cities with a population of more than 3 million was over, these cities had not been able to achieve anything significant in this direction. This amendment thus extended the deadline for implementation for the first phase. The second amendment to the rules was notified on 2 June 2000 (called BMW Rules, 2000). Some of the major changes made included defining the role of the municipal body of the particular area, nominating Pollution Control Boards/Committees as Prescribed Authorities, addition of forms for seeking authorization to operate a facility and for filing an appeal against order passed by the prescribed authority. The entire country now comes under the umbrella of the rules as 31 December 2002 was the deadline for the last phase of implementation of the rules covering all the health care institutions, cities, towns and villages nationally.

DEFINITION AND CLASSIFICATION

According to the Parivesh News Letter⁴ bio-medical waste may be defined as "any solid, fluid or liquid waste, including its container and any intermediate product, which is generated during its diagnosis, treatment or immunisation of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals and the animal waste from slaughter houses or any other like establishments."

According to Sub-rule (5) of Rule 3 of the Bio-Medical Waste (Management and Handling) Rules⁵ 1998, biomedical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals and including categories mentioned in Schedule I such as human anatomical waste, animal waste, waste sharps, discarded medicines & cyto-toxic drugs, soiled waste, solid waste etc.

³ Ibid

⁴ Parivesh Newsletter, March 1998: Central Pollution Control Board, Vol.4 (IV), p.3

⁵ Hereinafter called the 'Rule'

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Though Schedule I to the Rule provides ten categories of biomedical waste but these are considered not exhaustive and clear. For example, the Rule should have specifically categorised "contaminated unused sharps", as the unused sharps in the original packaging cannot be called waste in true sense and, moreover, they do not have any adverse effect on human beings and the environment. Likewise, in discarded medicines and cyto-toxic drugs there is no involvement of living beings and as such they cannot be called as biomedical wastes rather they may be termed as medical waste. It may be pointed out that the Rules do not also provides for some wastes which are part of biomedical waste. These are radio-active waste, hospital kitchen waste, gaseous waste, linen waste etc. and in the category of chemical waste which is generated out of chemical used in the production of biological substances or used for disinfections are considered medical waste and in no way be termed as bio medical waste in view of non-involvement of human beings within this category.

GENERATOR OF BIO-MEDICAL WASTE

"Generator" means any person nominated on behalf of a hospital, nursing home, clinic, dispensary, laboratory, animal house, slaughter house, veterinary institutions including those established by or under, the control of Govt. which generates or cause to be generated, handles or cause to be handled any Bio-Medical Waste or where no such person is nominated the person incharge there of. Thus, all the Hospitals, nursing homes, veterinary hospitals, clinics, dispensaries, diagnostic laboratories, pathological laboratories, blood banks, mortuary and any other health care establishments are the potential generators of Bio-Medical Waste.⁶

SOURCES OF BIO MEDICAL WASTE

Major Sources:

- Govt. hospitals/private hospitals/nursing homes/dispensaries.
- Primary health centers.
- Medical Colleges and research centers/paramedic services.
- Veterinary Colleges animal research centers.
- Blood banks/mortuaries/autopsy centers.
- Biotechnology institutions.
- Production Units.

Minor Sources:

- Physicians/dentists' clinics.
- Animal houses/slaughter houses.
- Blood donation camps.
- Vaccination centers.
- Acupuncturists/psychiatric clinics/cosmetic piercing.
- Funeral services.
- Institution for disabled persons.

⁶ Baghotia K.S., Study of Waste Management Practices in tertiary care hospital, thesis work submitted for M.D.Community Health Administration at NIHFV, 1998

RATIONALE BEHIND MANAGEMENT OF SUCH WASTE

Hospital waste management is a part of hospital hygiene and maintenance activities. According to the report of the World Health Organisation (WHO), around 85% of the biomedical wastes are actually non-hazardous wastes, 10% are infectious and 5% are non-infectious but hazardous wastes.⁷ Approximately 1.45 kg. waste is generated per patient per day in Indian hospital whereas it is much higher in developed countries.⁸ The question then arises that what is the need or rationale for spending so much resource in terms of money, man power, material and machine for management of hospital waste? The reasons are depicted in the following table:⁹

Health Hazards of the Waste

Potential Hazards	Waste Materials
Psychological Stress	Human Anatomical Waste,
Infections and Diseases: HIV/AIDS, Hepatitis B & C, Hemorrhagic fever, Herpes, Measles, Shigellosis, Salmonellosis, Pneumonia, Septicemia, Bacteremia, Cholera, Tuberculosis, Anthrax, Helminthic infections, Candidiasis and others	Human Anatomical waste, Soiled Waste, Microbial/Biotech waste, Sharps,
Infections: Rabies, Anthrax, and other	Animal waste
Animal waste	Sharps, cytotoxic & Radioactive dmgs, Incinerator waste;
Dermatitis, Conjunctivitis, Bronchitis,	Chemical, Cytotoxic, Radioactive, Incinerator wastes,
Cancer, Genetic mutation	Cytotoxic, Radioactive drugs and materials, Chemical Wastes
Poisonings	Cytotoxic & other drugs, liquid & Chemical wastes,

HOLISTIC APPROACH OF JUDICIARY

The hospital wastes attracted the attention of the Supreme Court as early as in 1994 when a writ petition was filed under Article 32 of the Constitution of India against the concerned authorities to provide clean and health environment. Issue of improper hospital waste management was the crux of the case in *Dr. B. L. Wadhwa v. Union of India*¹⁰ the court gave series of directions. The most important among them are :

7 Dr. Srivastava Lily, Law and Medicine, Universal Law Publishing Co, New Delhi, 1st ed., 2010

8 Manual on Hospital Waste Management: Central Pollution Control Board, March 2000

9 Kishore, J., Ingle, G.K., Biomedical Waste Management in India, Century Publications, New Delhi, 2004

10 AIR 1996 SC 2969

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1. All hospitals with 50 beds and above should install incinerators or any of effective alternative method under their own administrative control.

2. The incinerator or alternative methods should be fitted with necessary pollution control mechanism, approved and confirming to the standards laid down by the Central Pollution control Board.

3. The Central Pollution control Board and the State Pollution Control Boards should regularly send its inspection teams in different areas to ascertain that the collection, transportation and disposal garbage/wastes is carried out satisfactorily.

Since the decision of the Hon'ble Supreme Court various High Courts in different cases brought before it have been given direction to be followed by the HCUs in this regard. The court has also issued direction to initiate criminal proceeding against the violator of the Rules.

In *W. B. Nursing Homes Association & Ors. vs. State of West Bengal & Ors.*,¹¹ the West Bengal Nursing Homes Association moved before the Hon'ble High Court, Calcutta against the direction of the WBPCB on the health-care units. The order was to ensure that treatment of bio-medical wastes is done with the units either joining a common bio-medical waste treatment facility or setting up their own immediately and also against realization of charges for collection of bio-medical waste on the basis of number of beds. The Hon'ble Environmental Bench, High Court, Calcutta after hearing the parties and considering the affidavit of the Board was pleased to dismiss the writ petition summarily upholding order of the Board.

Recently the Orissa high court directed the State Pollution Control Board to initiate criminal proceedings against seven district headquarter hospitals for continuous violation of Biomedical Waste (Management and Handling) Rules. "The division bench of Justice L Mohapatra and Justice I Mohanty has directed the board to file criminal cases against the in-charges of bio-medical waste management at the district hospitals of Angul, Dhenkanal, Bhadrak, Balasore, Boudh, Deogarh and Sambalpur under the Environment Protection Act, 1988," said amicus curie P R Das. The directive came in the wake of a petition filed by a social organization, Maitree Sansad. It has alleged that these hospitals have been long flouting biomedical waste handling rules. Even the high court-appointed advocate's committee had visited these hospitals and found deficiencies in the biomedical waste disposal system. Warnings were also issued to these hospitals but nothing was done by them to improve the situation, stated the amicus curie.¹²

STEPS IN HOSPITAL WASTE MANAGEMENT

Segregation

Segregation of wastes is the most important prerequisite in the process of waste management. This stage is the key to the whole management process, because it is at this stage that wastes are segregated as infectious and non-infectious, thus minimising the risks to staff and public as well as resources used for the treatment purpose. Segregation of waste allows special attention to be given to the relatively small quantities of wastes and thereby reducing the risks and the cost of handling and disposal of the

¹¹ Legal matters, Annual Report, W.B. Pollution Control Board, 2004-05.

¹² The Times of India, Bhubaneswar, Sept. 29th 2012.

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same. Rule 6¹³ of the biomedical waste Rule dealt with the aspect of segregation, packaging, storage and transportation. Schedule II on the one hand deals with colour coding and type of container for disposal of biomedical waste, Schedule III on the other lays down the method for labeling the waste containers or bags. The containers or bags for storing segregated wastes should be clearly identifiable.

For the purpose of segregation, such wastes can be broadly classified into the following categories :

- General or non-hazardous/non-infectious medical waste.
- Infectious or hazardous medical waste- needs special and careful management.

The World Health Organisation (WHO)¹⁴ has recommended following classification of segregation of biomedical wastes:

- General non-hazardous wastes,
- Sharps (whether infected or not),
- Infected waste not containing sharps,
- Chemicals and pharmaceuticals other than cytotoxic drugs, and
- Other hazardous waste including radioactive wastes, cytotoxic drugs and high pressure container.

Sharp Management

Sharp can be defined as objects that are capable of puncturing and cutting due to any points or proturbences and includes syringes, needled, scalpels, blades, pasteur pipettes and broken glass or plastic. Sharps needs special attention while segregating and storing because needles can act as a reservoirs of pathogens in which the pathogens may survive for a long time because of the presence of blood and also that the sharps can provide a direct route into the bloodstream by puncturing the skin. In fact, 98% of the health facilities generate sharp waste.

Packaging

Under Rule 6, after segregation of wastes into infectious and non-infectious category it should be packaged properly. The infectious packaging of the waste shall be treated and disposed of in accordance with Schedule I. the non-infectious or non-hazardous waste shall be picked up and transported by the Municipal body at municipal dump site. The packaging must be labeled on the basis of its character and also label for transport must be prominently visible.

Schedule II of the Rule provides colour coding for the containers/bags in order to segregate the biomedical waste which are categorised as non-hazardous/non-infectious and hazardous/infectious.

13 Rule 6(2): "Bio-Medical Waste shall be segregated into containers or bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. The containers shall be labeled according to Schedule III.

14 Basu. Soma, Medical Waste Disposal, Burning Problem, The Hindu Survey on the Environment 1998, at p.177.

- Yellow plastic bag that needs to incinerate or deep buried may contain human anatomical waste, animal waste, microbiological waste and soiled waste.
- Red disinfected container or plastic bag that need to be autoclave, disinfected with chemical, or microwaved used for plastic waste and chemical treatment for microbiological waste, soiled waste and solid waste.
- Blue or white plastic bag or puncture proof container need to autoclave, microwaved, chemical treatment and destruction or shredding which includes wastes like waste sharps, solid waste etc.
- Black plastic bag that used to be sent for secured landfill or burial incineration. used for discarded medicines and cytotoxic drugs, and chemical solid waste.

Labeling

Labeling is essential in the correct identification and safe management of medical waste. It makes easy to understand the different categories of wastes. By way of raising awareness the health care personnel would be in a position to identify the type of waste contained in the bag or container which is to be made prior to the collection of biomedical waste. It would be better if bags and bins provided are already labeled with the appropriate hazard symbol e.g. biohazard and cytotoxic hazard symbols. This will help in waste audit conducted at treatment and disposal site to identify those areas that are in compliance or non-compliance with the required hospital waste management practices.

Storage

According to sub-rule 5 of Rule 6, infectious waste cannot be stored more than 48 hours. However, the hospital waste may need to be stored if immediate treatment and disposal cannot be done. For this purpose the authorized person must take permission from the prescribed authority and take necessary steps to ensure that the waste does not have any adverse affect on human health and the environment. These wastes should be refrigerated on-site to prevent rolling and offensive smell. Waste may be stored off site before treatment and final disposal. Such area need to be notified by the government authority. All storage sites must be concrete and should be designed to allow wash out with the help of water.

Transportation

Wastes are to be collected and deposited from clearly sign posted and designated collection points in hospital wards. Where open trolleys are used to collect containers or bags of waste from bin, each bin and trolley must be thoroughly cleaned and disinfected with a hypochlorite solution at least once a week. For the purpose of transportation of such waste the method has been prescribed in Schedule III and Schedule IV. Such waste should never be transported with general municipal waste and these should be kept separate at all stages. It may be pointed out that such vehicles have yet to come on many Indian roads. Therefore, the concern for careful transportation of medical wastes will continue to remain a paper rule unless the infrastructures is developed and put into operation.

CHALLENGES TO HEALTH CARE WASTE MANAGEMENT PRACTICES IN INDIA

The major challenges identified are:

Lack of Segregation Practices

Segregation practice prevents non-infectious waste to get mixed with infectious waste. Lack of segregation practices significantly increases the quantity of infectious medical waste as mixing of infectious component with the general non-infectious waste, makes the entire mass potentially infectious.¹⁵ There is inadequate practice of segregation of the waste starting from generation to disposal as seen in Indian hospitals. Even if the segregation of waste at the point of generation is effective, waste handlers are found mixing it together during the collection and results in loss of ultimate value of segregation.¹⁶

Poor Regulatory Measures

In India, Central Pollution Control Board and the State Pollution Control Boards, the agencies responsible to enforce these rules in hospitals are on one hand lacking adequate power and on the other hand there is no commitment. As a result, most of the large hospitals have not complied with these rules even after expiry of new deadlines.¹⁷ Even the regulatory authorities have to take the blame for not doing enough to ensure implementation. There is lack of coordination between the regulatory authorities (pollution control boards/committees) and Department of Health who exercise functional control over all healthcare facilities in one way or the other; and lack of will to enforce implementation. No agency has been assigned the task of spreading awareness.¹⁸ Moreover the Rules have not been publicised as widely as required. Hence, smaller HCUs may not be fully aware of them. A number of issues have not been dealt with in detail, such as standards of collection and storage devices, equipment, etc.

Waste-picking and Reusing

Reuse of plastic syringes and other plastic material used in the health care is a thriving business of billions of Indian Rupees. More than one million people are engaged in rag picking. The estimated figure of business on this score in Delhi alone is more than 50 million Indian Rupees per year.¹⁹ Lucrative monetary returns and lack of awareness about the problems associated with biomedical wastes encourage waste-picking and reusing activities. It would not be fair to blame the rag pickers only for this as the circle of connivance starts from the hospital staff itself. It thereafter goes to the waste handlers, then to the rag pickers, to the packaging outlets situated in a decrepit area of a 'basti (slum)', to the medical shop, and finally sold to the unsuspecting patients or their relatives.

- 15 Gupta S. and Boojh R., Report: Biomedical waste management practices at Balrampur Hospital. Lucknow, India. Waste Management Research. 2006.
- 16 Athavale A.V., and Dhunale G. B., A Study of Hospital Waste Management at a Rural Hospital in Maharashtra. Journal of ISHWM. 2010.
- 17 Dwivedi A.K., Pandey S., and Shashi. Fate of hospital waste in India. Biology and Medicine. 2009
- 18 Verma L.K., Managing Hospital Waste is Difficult: How Difficult? Journal of ISHWM. 2010.
- 19 Id.

FINANCIAL CONSTRAINTS

With dedicated systems being installed in most of the HCUs, financial provision is necessary for capital and recurring expenditure including funds for sufficient manpower, disinfectants, devices and equipment. Normally, a separate allocation of funds for waste management is not found in Indian hospitals. Additionally funds are required for conducting training and awareness programs for health care staffs. Smaller HCUs ignore waste management practices due to financial constraints.²⁰

INADEQUATE AWARENESS AND TRAINING PROGRAMS

Awareness of appropriate handling and disposal of health-care wastes among health personnel is a priority; it is essential that everyone should know the potential health hazards. Regular programs will help prevent exposure of health-care wastes and related hazards. Poster exhibition, proper labeling, and explanation by staff are effective methods. Seminars and workshops, and participation in training courses are also essential.²¹ Management in most of Indian hospitals is not aware of cost savings achieved due to good waste management practices. It has also been estimated that disposal savings of between 40% and 70% could be realised through the implementation of a healthcare waste reduction program.²²

NEED FOR NECESSARY SAFETY MEASURES

It should be ensured that:

1. All personnel should be made aware of the potential risk of mishandling it.
2. It is the responsibility of the administrator of every health care institution to set programme for the maintenance of potentially infectious waste besides the methods provided under the Rule.
3. Proper training should be given to all engaged including the persons who disposed of the residue after final treatment. During the training, special emphasis should be given on the need to segregate at the point of generation particularly to potentially infectious waste.²³
4. Drivers, collectors and other handlers should be made aware of the nature and risk of the waste.
5. Written instructions provided regarding the procedures should be adopted in the event of spillage/ accidents.
6. Protective gears should be provided and instructions regarding their use should be given.
7. Workers should be protected by vaccination against tetanus and hepatitis B.
8. Efforts must also be made to recycle waste wherever possible with due regards to environment.

20 Rao S.K.M., Ranyal R.K., Bhatia S.S. and Sharma V.R., Biomedical Waste Management : An Infrastructural Survey of Hospitals. Medical Journal Armed Forces India. 2004.

21 Supra note 17.

22 Tudor T.L., Noonan C.L. and Jenkin L.E.T., Healthcare waste management: a case study from the National Health Service in Cornwall. United Kingdom Waste Management. 2005.

23 Sahai, Sushma. Bio-Medical Waste Management, APH Publishing Corporation, 2009

9. To ensure the safer handling of sharps, manufactures have to develop mechanisms to render the syringes 'non-sharp' immediately after use. This will reduce needle stick injury by preventing the puncture.
10. No loose sharps are to be disposed of into plastic bags, as the bag can be punctured or cut by the sharp offering the potential for injury to waste handlers. Either sharps should be place in a puncture resistant container or mutilate them at the point of generation which is possible only by raising the awareness regarding the potential risk of such sharps.
11. The untreated waste shall be transported only in such vehicle authorized for the purpose by the competent authority.

EVALUATION OF WASTE TREATMENT TECHNOLOGIES

Schedule I read with Rule 5 provides large number of modes through which a particular biomedical waste shall be treated or disposed of. Such treatment and disposal should be made in accordance with the standards prescribed in Schedule V. These include incineration, autoclaving, microwaving, mutilation or shredding, chemical treatment or disinfection, land fill and deep buried and discharge in drains. Syringes, needles and gloves after use should always be disinfected with freshly prepared bleaching powder solution, i.e. 1% hypochlorite solution or autoclaved before mutilation or shredding.

For proper understanding of treatment of biomedical waste it has divided into ten broad categories of treatment technologies.

1. Mechanical Processes,
2. Thermal Processes,
3. Autoclaving and Hydroclaving,
4. Microwave Treatment,
5. Incineration,
6. Plasma Systems,
7. Chemical Processes,
8. Irradiation Processes,
9. Biological Processes and
10. Landfill or Burial.

The primary purpose of autoclave is to sterilize/disinfect the wastes. Microorganism, which contribute to infection do not survive beyond high temperature. At this temperature and pressure, microorganisms are completely destroyed and thus render the wastes infection free. The disinfected waste from the autoclave is led for the segregation of rubber, glass, plastics and metals. At the incineration the Wastes are burnt partly by electric burners and partly by addition of diesel. The ashes from the incinerator are disposed by means of secured land filling. The size of the landfill is about 4.5m x 9m and the depth of about 3.6m. The landfill is filled up with the alternate layers of blue metals and gravels. Each layer is covered with clay sheets and finally the whole layer is covered with the sand layer.

SUGGESTIONS

Waste avoidance and waste minimization at source:

In the hierarchy of waste management, waste avoidance and waste minimization have to be attempted first.

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Inventory of hazardous waste generation:

As per the Hazardous Waste regulations, industries are required to store hazardous waste for a period not exceeding 90 days. The waste could either be recycled/reused or disposed of in captive or common Treatment, Storage and Disposed Facilities (TSDF) available in the state, or be incinerated.

Reuse, recovery and recycling of hazardous waste:

Industrial associations/industries should explore options/ opportunities of reusing, recovery and recycling of hazardous waste in an environmentally sound manner. Establishment of 'Waste exchange Banks/Centres' should be encouraged to provide information on wastes and promote reuse, recovery and recycling technologies which upscale the quality of resource recovery.

CONCLUSION

The scenario of bio-medical waste demands better management. The present rules are ineffective to manage the bio-medical waste. Hence, a draft bill has been placed by the Union Ministry of Environment & Forests in 2011 for public opinion. Unfortunately, in the draft bill the modified definition of biomedical waste, occupier, etc. did not find any place. Law has stumbled in performing its duty; much of attribute from the lack of proper implementation mechanism. Time has come to act seriously and implement the rules effectively. Greater commitment is required on the part of the Government looking into the magnitude of the problem. The regulatory body should be strengthened. Such regulatory body along with the municipality, corporation and non-governmental organization must work together to make effective implementation of the Rule. The occupier of the institutions should prepare a general hospital policy to be followed strictly. There is a need for a fresh look at the rules. The Rules mentions pollution Control Boards as the prescribed authority. However these Boards are over stressed because of lack of revenues, infrastructure, manpower and technical power to implement the existing legislative requirement. New responsibilities of this kind will certainly put added pressure on Boards and in turn may result in poor implementation. These Rules and their implementation highlight the fact of total unpreparedness on the part of the states, in terms of both infrastructure and skill, before evolving the Rules. New responsibilities of this kind will certainly put added pressure on Boards and in turn may result in poor implementation. The Rule speaks about the State Pollution Control Board, Pollution Control Committees and Advisory Committee. Such authority shall have to function under the supervision and control of the concerned State Government or Union Territory and thus limit the function of such authority as it has to work under the appointing authority and the discretion lies under the government's hand. It is suggested that in place of an expert in medical sciences, a representative of the State Medical Council be substituted and a law member may also find place as a member of the committee. Thus it can be submitted that the Rule is incomplete also to the extent of prescribed authority.

The Rules must drop the plan of imposition of setting up of a treatment plant in every hospital. The Rules should devote its attention towards establishment of common treatment sites which includes incinerator or autoclave, shredder and an engineered pit despite the fact that the occupier/operator has means potential to handle the same. The Rules must be strictly enforced with Proper segregation is the secret of proper regulation bio-medical waste. Training of these personnel will lay road in that direction. Since the hospitals have become the source of huge profits. They owe a duty to protect the interest and the safety of its workers and the public.

