

## **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*<sup>1</sup> 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

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<sup>1</sup> 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.<sup>2</sup>

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%.<sup>3</sup> 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.<sup>4</sup>

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

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

<sup>4</sup> 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 careless 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 a detailed 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 detailed 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 a 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 a risk factor to those persons handling the same. Only this category of Bio-Medical Waste has a far-reaching impact on the health of human beings causing many dreadful diseases including Hepatitis A, B and C, AIDS etc. which deserve special mention. Taking into consideration its harmful effect, the chapter also refers to 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 categories 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 an attempt shall be made to analyse various International environmental Conferences and Conventions held from time to time that have

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.