Chapter 1
THE PROBLEM AND ITS SETTING

1.1 Introduction

There is a telling adage which says: “We have not inherited this world from our parents; we have merely borrowed it from our children.” It is a fact that the Earth is not inherited; rather it is merely to be held in trust for generations to come! Just like natural resources have to be used prudently whenever required, keeping in mind the needs of the future, the environment too has to be preserved in the best possible manner, taking all necessary precautions that science has provided. Balancing the interests of the present with those of the future has indeed become a difficult task in itself due to the selfish and unmindful tendencies of human nature. This being so, there is a constant conflict of interests with matters relating to environmental protection.
Healthcare is undoubtedly an inevitable facet of human existence. The very functioning of a healthcare establishment generates waste which in turn needs to be effectively managed. The legal control of the management of such waste in India is the focus of this study with special reference to the State of Goa during the first decade of the 21st century.

Humankind has been grappling with innumerable problems right from the day he was forced to tread on this Earth. The undaunted pursuit for survival has, no doubt, prodded him, but his vulnerability at the same time has increased manifold. The greatest challenge that man has ever faced which has enervated his might in the modern context is the environmental degradation in the form of global warming, ozone layer depletion, acid rain, famine, droughts, floods, pollution of air, water, land, etc.\(^1\)

In the pursuit of preserving the health of mankind, the human brain invented medicine and curative processes including surgery. 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. AIDS\(^2\) is one such disease that man is yet to conquer. As health is wealth, health of nature is wealth of the

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2 Acquired Immune Deficiency Syndrome or acquired immunodeficiency syndrome (AIDS) is a disease of the human immune system caused by the Human Immunodeficiency Virus (HIV). This condition progressively reduces the effectiveness of the immune system and leaves individuals susceptible to opportunistic infections and tumours. HIV is transmitted in many ways – by the use of syringes or getting hurt by sharp objects containing the virus and through direct contact of a mucous membrane or the bloodstream with a bodily fluid containing the virus.
universe and this holds for generations to come. It is the responsibility of everybody to preserve nature for the future.

The health status of an individual, a community or a nation is determined by the interplay and integration of two ecological factors i.e. the internal environment of the human being himself and the external environment which surrounds it. Disease spreads due to the disturbance in the delicate balance between humankind and the environment. The science of safeguarding health is known to people as ‘sanitation’ and it covers the whole field of controlling the environment with a view to prevent disease and promote health.³

The problem of environmental pollution which started with the advent of the human being on Earth has now become extremely acute, both in developed and developing places. Due to loss of self-cleaning capacity of the air, developed countries have laid down stringent safety standards and measures to maintain the power of the balance of nature in the area of waste management, particularly in the area of Bio-Medical Waste Management. But the developing countries have delayed such pollution problems, which is very harmful, detrimental or injurious to public health, safety and welfare as Paul

Harrison⁴ in his book ‘The Third World Tomorrow’,⁵ has warned that there would no tomorrow for the third world countries if such pollution problems continue to remain in the society for non- adoption of anti-pollution strategies. Therefore, it can be emphasized that eco-development is one of the sensible preconditions of sustainable development, and for that matter immediate measures are required to be taken to stem the terrible implication of nature resulting from non-scientific disposal of Bio-Medical Waste.⁶

Scientists and religious heads believe that nature was created first and then living beings were introduced to live on nature, which includes the five major components called Pancha Bhuta⁷-water, air, earth, fire and sky. Every living being contains these five elements within its body. Like the need to maintain these elements within body, there is a greater need to protect them in nature too and in the process such maintenance should not become the reason for destruction or pollution.⁸

Economic processes of a society need continuous flow of materials. Humankind takes from the environment a wide variety of vegetables,
minerals and animal materials; transforms them into a wider variety of economic goods, consumes these goods, a process during which these goods undergo physical or chemical transformation and become, in effect, garbage; and then discards these unwanted products of consumption into the environment. Unwanted materials - solid, liquid, or gaseous are also generated during these processes and they too are discarded into the environment.\(^9\)

With the onset of industrialization, generation of such unwanted materials or waste production increased proportionately with the production of goods. Rapid and unprecedented industrial development has thus brought many environmental and health problems. Although the industrial and technological advancements have helped to improve food products, raise living standards, solve time and space problems, they have adversely affected the natural environment and thereby disturbed ‘the balance of nature’. The capability of self-maintenance and self-regulation of our system has been disrupted by the continuous discharge of pollutants by the industries and their products. Moreover, improper treatment and discharge of waste and its unhygienic disposal has created a serious problem for biotic\(^{10}\) and abiotic\(^{11}\) components of the environment.\(^{12}\)


\(^{10}\) In biology, ‘biotic’ components are the living things that shape an ecosystem. They are any living component that affects another organism. Such things include animals which consume the organism in question, and the living food that the organism consumes.

\(^{11}\) In biology, ‘abiotic’ components are non-living chemical and physical factors in the environment. These phenomena underlie all of biology. These factors, while generally downplayed, can have enormous impact on evolution. ‘Abiotic’ components are aspects of geodiversity. From the
Handling and disposal of wastes has become a big task due to growing urban population. Improper disposal has become one of the challenging problems of urbanization. Waste is generally defined as “something which is not put into proper usage at a given time”. The original definition of waste res derilicta corresponds to the concept of ‘throw away’ culture. Waste generally, is of three kinds, viz. solid wastes, liquid wastes and gaseous wastes. Waste can also be categorized according to its origin as domestic waste, industrial waste and hospital waste.

The word ‘waste’ refers to useless, unused, unwanted or discarded material. Waste can be classified by multitude of schemes: by physical state (solid, liquid, gaseous), and then within solid waste by original use (packaging waste, food waste, etc), by material (glass, paper, etc), by physical properties (combustible, compostable, recyclable) by origin (domestic, commercial, agricultural, industrial, etc.) or by safety level (hazardous, non hazardous). In India, for regulatory purposes, waste is generally classified into municipal solid waste and hazardous waste.

viewpoint of biology, ‘abiotic’ influences may be classified as light or more generally radiation, temperature, water, the chemical surrounding composed of the terrestrial atmospheric gases, as well as soil.

14 Meaning the abandoned object in latin.
1.2 Meaning and Ambit of Bio-Medical Waste

Over the years there have been tremendous advancements in the healthcare system. However it is ironic that the healthcare settings, which restore and maintain community health, are also threatening their well-being. Poor waste management practices pose a huge risk to the health of the public, patients, professionals and contribute to environmental degradation.\textsuperscript{17}

Bio-Medical Waste is defined as any waste fabricated during the diagnosis, testing, treatment, research or production of biological materials by either animals or mankind. Such waste has the potential to be hazardous to human health if it is left unregulated. It originates from Bio-Medical Waste facilities, such as hospitals, clinics, nursing homes, laboratories, funeral homes, dentist offices, veterinarian or physician complexes, medical transporters (e.g., ambulances) and storage and treatment facilities for biological entities since they all produce Bio-Medical Waste. It contains human body parts, tissues and organs as well as animal body parts, carcasses, excreted bodily wastes, parts containing blood and wastes generated at veterinary hospitals. Besides, microbiology and biotechnology cultivate Bio-Medical Waste in the form of laboratory cultures, live or non-live vaccines, and human and animal cell cultures used during research.

\textsuperscript{17} Joseph, J. and Krishnan, A., (2004).
\textit{Hospital waste management in the union territory of Pondicherry – An exploration.}
Items that come into contact with biological-waste functions are also considered Bio-Medical Waste originators. Needles, syringes, blades, scalpels, blood stained material or cotton balls and dirtied plasters are a few such examples. Discarded medicines, used tubing and catheters, chemicals used for disinfection purposes and any waste that is a consequence of laboratory upkeep are all instigators of Bio-Medical Waste as well.\(^\text{18}\)

In the area of pollution, the management of wastes is a perennial agenda and of these wastes, the Bio-Medical Waste is a special kind of waste. The infectious nature of the Bio-Medical Waste itself reveals the danger of its mismanagement. Bio-Medical Waste (also popularly called healthcare waste or hospital waste) is a by-product of healthcare and includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. Generation of Bio-Medical Waste in sizeable quantities, depending upon the number of patients and the nature of activity, is an unavoidable side effect of healthcare delivery systems which primarily and predominantly takes within its fold processes like diagnosis, treatment, surgical intervention, post-operative care, rehabilitative care, clinical research, clinical trials, etc.

Inadequate and poor handling or management of this waste exposes healthcare workers, waste handlers, patients and the community in general to

infections, toxic effects and serious fatal consequences as well. This is recognized as ‘pollution’ according to definitions used in the United Kingdom\textsuperscript{19} which explained it as “The introduction by man into the environment of substances or energy liable to cause hazards to human health, harm to living resources and ecological systems, damage to structure or amenities or interference with legitimate uses of the environment.”

World Health Organization (WHO), in its classification of waste, classifies Bio-Medical Waste into the following categories: General waste, Infectious waste, Pathological waste, Radiological waste, Chemical waste, Pharmaceutical waste, Sharps and Pressurized waste. This categorization is on the basis of weight, density and constituents of the waste. As per the available documentation, in a given context of a modern hospital, the average waste ranges between 1.5 and 2.5 Kg. per day per bed. It constitutes plastics, paper, glass, linen, metal, human flesh and organic tissues. The percentage of wastes may vary from hospital to hospital, depending upon its practices.\textsuperscript{20}

In India, however, the average rate of generation of Bio-Medical Wastes is comparatively less and varies from 1 kg to 1.5 kg per bed per day. It is estimated that an average hospital generates about 16 per cent materials that could be considered as potentially infectious agents. Studies reveal that about 7\% of typical hospital wastes are pathological waste including body

\textsuperscript{19} For eg. Section 1(3) of the Environmental Protection Act, 1990 (UK)
\textsuperscript{20} http://www.who.int/water_sanitation_health/medicalwaste/002to019.pdf visited on 12.12.2005
parts etc, which need to be incinerated. By implementing good segregation programs, it is possible to reduce this Waste stream to a lesser extent. The estimated amount of unregulated infectious waste per day per bed varies between 800 gms and 1100 gms, which if regulated, would vary between 50 gms and 500 gms. Releasing such hazardous waste from hospitals without treatment will pose a serious threat to health of human beings and environment.

A lot of hospital waste is hazardous material. Common hazardous waste found in hospitals include the chemotherapy and anti-neoplastic chemicals (cancer chemotherapy and cytotoxic drugs), formaldehyde, photographic chemicals, radio nuclides, solvents, mercury waste, anaesthetic gases and cleaning and maintenance chemicals and supplies (chlorine, paint, insecticides, phenyl). The hospital wastes include pathological and radioactive wastes. Pathological waste means tissues, organs of body parts, human foetuses, animal carcasses and most blood and body fluids. The radioactive waste (solid, liquid, and gaseous wastes contaminated with radio-nuclides) is generated from in vitro or in vivo testing.

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21 http://medind.nic.in/haa/t01/i1/haat01i1p75o.pdf visited on 12.12.2005. Also see Fig 1(ii) at p. 13.
22 Agarwal Anek, Bio-Medical Waste Management in Indian Hospitals – Why and How? A study conducted on hospitals in Mumbai as a project in Management course. The author suggests that the approach of such reduction it requires disinfecting at regular intervals for storing the infectious wastes.
23 See supra note 20 at p. 9. In vitro means outside the body, eg. laboratory work and in vivo means inside the body, eg. in clinical trials.
Besides, there will be chemical wastes with discarded solid, liquid and gaseous chemicals from diagnostic chemicals, experimental procedures and disinfecting procedures. Infectious waste include cultures and stocks of infectious agents from laboratories, waste from surgeries, and autopsies on patients who have died due to infectious diseases, waste from infected patients in isolation wards, and dialysis waste from infected patients. Needles, syringes, scalpels, blades, broken glass, nails and items that could cause a cut or puncture which may become a source of entry of infecting agents are categorized as ‘sharps’. Unused drugs and chemicals, returned from wards constitute pharmaceutical wastes.

Although medicines and surgical operations help in curing diseases, improper methods of disposing wastes generated in the process will be the cause of diseases as a result of the ‘treatment’. As a result, the very purpose of the medical inventions and scientific research will be defeated. There is therefore a duty to see that the Bio-Medical Waste generated will not develop into a monster taking away the fruits of centuries of research and pushing society into disaster.

The different location or points of hospital waste generation are the Operation Theatres (OTs); various wards; Labour rooms; Out-Patient departments (OPDs); dressing rooms; injection rooms; Intensive Care Units (ICUs), Coronary Care Units (CCUs), dialysis rooms; laboritories; corridors
and compounds of hospitals or nursing homes. It is estimated that a large percentage of Bio-Medical Waste is non-hazardous. Only small fractions of such waste are infectious like sharps and liquids and an even smaller fraction have hazards like chemical wastes.

A detailed classification of hospital wastes shown in Fig. 1(i) indicates the several types of wastes that can exist in a hospital setup.

**CLASSIFICATION OF HOSPITAL WASTES**

Fig. 1(i)

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24 Source: WHO. *Supra* note 20 at p. 9.
For the purpose of giving an overview of the same, a broad classification of such wastes in India has been pictorially depicted in Fig. 1(ii). All figures mentioned therein are in percentages.

PERCENTAGE LAYOUT OF BIO-MEDICAL WASTES

![Percentage Layout of Bio-Medical Wastes](image)

**Fig. 1 (ii)**

In India, Bio-Medical Waste Management and handling has assumed tremendous significance in the emerging discipline of healthcare law and ethics. This development is basically because of two factors:

(i) Ever expanding and entrenching public and private healthcare delivery centres generating sizeable quantum of Bio-Medical Waste. Healthcare establishments (both private and government) in India have

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25 Source: Indian Society of Hospital Management, http://www.medwasteind.org visited on 5.4.2006. It is based in Pune and is a registered body of professionals to address the issues and concerns of hospital waste at the national level, and to facilitate/advocate/undertake research activities on issues of hospital waste management and eco-friendly disposal.
registered a 15 to 20 per cent growth in the last decade.\textsuperscript{26} Same trend is likely to continue for another decade.

(ii) Awareness about the Bio-Medical Waste, its perilous effects and fatal consequences. This is due to rising levels of literacy amongst the people and a degree of precaution being exercised by the common man and the patients, both admitted and out-door.\textsuperscript{27}

The State of Goa has a rapidly growing healthcare delivery system, both in terms of Government involvement and in respect of private players, who have been responsible for the mushrooming of new hospitals with super-specialties and state-of-the-art facilities.\textsuperscript{28} This is mainly due to the fact that Goa is a domestic and global tourist destination that has converted it into a hot spot for medical tourism.\textsuperscript{29} Needless to say, such healthcare establishments are expected to generate a large quantum of hospital waste, especially where ‘foreign patients’ expect the ‘dispose after use’ rule for practically every durable used in the establishments. Healthcare is an inseparable part of human resource and therefore, such a situation, coupled with the ever-rising migrant labour class presence, due to the year-round Real Estate industry, have increased the demand for additional healthcare facilities like pathology laboratories, dental clinics and dispensaries on a regular

\textsuperscript{26} Ibid.
\textsuperscript{27} Joga Rao S. V., Bio-Medical Waste and the Law – A referral Guide; 1\textsuperscript{st} Edition, Legalaxy, 2004
\textsuperscript{28} See para 4.2 at p.
\textsuperscript{29} Ibid. All these private establishments have web-sites to cater to touring patients who pay in foreign currency for different kinds of medical facilities. Rates of different ‘packages’ are reflected in these sites.
basis. All of these will, but naturally, contribute to the rising quantum of Bio-Medical Waste generated in the state. In view of these facts, the State of Goa will witness the amount of Bio-Medical Waste generating for the next decade increasing to several metric tons/day.

It is in this context that the researcher intends to study in great detail the legal control of Bio-Medical Waste Management in the existing healthcare scenario in the State of Goa and in particular, the following aspects of it, viz. the growth of the establishments in the healthcare sector, the quantum of Bio-Medical Waste the state is generating, the problems this waste is posing to the environment and health, the status of the actual ways and means adopted to meet these problems of Bio-Medical Waste and the extent to which healthcare institutions abide by legal regulations in this regard. The researcher seeks to make certain suggestions and recommendations for effective management of Bio-Medical Waste in view of the available findings through this research and propose a specific legislation for the State of Goa in this regard.

1.3 The Impact of Bio-Medical Waste

Lack of infrastructure in most of the clinics results in mixing of infectious, non-infectious and hazardous wastes which are then disposed into

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30 As informed by NGOs in interviews conducted.
31 See estimation of waste generated in the state of Goa at para 4.5 at p. 176
the community bins. Even though extremely hazardous and infectious waste constitute a small percentage of the total waste, when such waste is mixed with non-hazardous waste, the entire waste becomes hazardous/infectious, which drastically increases the chances of affecting the health of waste workers and rag-pickers. This also affects the normal management practices of municipal solid waste like composting and waste recovery/recycling. The impact of Bio-Medical Waste is also connected with the fact that several of these categories are not recyclable. Table 1.1 shows the several categories of Bio-Medical Waste stream, their impact and information in terms of whether or not they are recyclable.

### IMPACT OF BIO-MEDICAL WASTES

<table>
<thead>
<tr>
<th>Bio-Medical Waste Category</th>
<th>Impact</th>
<th>Recycling Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infectious Waste</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anatomical wastes (tissues, organs and body parts)</td>
<td>Infects waste handlers and dependants through direct contacts, vectors</td>
<td>Non-recyclable</td>
</tr>
<tr>
<td>Human blood, body fluids, bandages and cotton wastes and other medical washes</td>
<td>Infect through direct contacts or by vectors and spreads diseases like typhoid, tuberculosis, hepatitis, AIDS etc.</td>
<td>Non-recyclable</td>
</tr>
<tr>
<td>Microbial cultures and stocks (lab cultures, stocks or specimens of micro-organisms live or vaccines)</td>
<td>Causes health disorders like headache, cough, skin burn, eye burn, etc., when in contact. If not autoclaved causes serious infections</td>
<td>Non-recyclable</td>
</tr>
<tr>
<td><strong>Waste sharps</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Needles &amp; syringes</td>
<td>Spreading of infectious diseases like Tetanus, Hepatitis, AIDS and Septicemia</td>
<td>Illegally recycled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bio-Medical Waste Category</th>
<th>Impact</th>
<th>Recycling Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalpels, blades &amp; broken glass</td>
<td>Causes cuts on skin and body portion</td>
<td>Recyclable</td>
</tr>
<tr>
<td>IV fluid, blood &amp; urine-bags</td>
<td>Releases Dioxin and Furan, Suspended Particulate Matter, gases on incineration, oxides of sulphur, nitrogen and carbon</td>
<td>Illegally recycled</td>
</tr>
<tr>
<td>Catheters &amp; plastic tubing, PVC surgical gloves</td>
<td>Dissolution of DHEP chemical from PVC material may serve as human carcinogens and may disturb hormonal function</td>
<td>Illegally recycled</td>
</tr>
</tbody>
</table>

**Non-Infectious Waste**

| Cytotoxic chemical wastes (anticancer drugs, radioactive materials, phenyl, strong acids and alkalies) | Causes cytotoxicity and injury to cells in the form of cancer, ulcers, anemia, skin diseases, poisoning, Foetal abnormalities | Acids & Alkalies may be reusable after pre-treatment |
| Chemical wastes (used in the production of biological & disinfections process) | Causes health disorders like headache, cough etc. Some disinfection chemicals like pesticides and insecticides disturb the normal function of hormones and act as carcinogens | Reusable after pre-treatment |

**Solid Wastes**

| Food & canteen wastes, plastics, paper boxes and other wastes | No serious impacts | Recyclable after composting / pre-treatment |
| Incineration ash | Partially incinerated ash may spread diseases | Non-recyclable |

**Table 1.1**

Amongst all categories of Bio-Medical Waste, the sharps (which include syringe, needle, canula,\(^{33}\) broken glass, ampules, etc.) have the highest disease transmission potential through the direct prick/stab type injuries. Unorganised sectors like illegal slaughter houses, small commercial

\(^{33}\) A tube that can be inserted into the body, often for the removal or delivery of fluids.
establishments, roadside vendors, tiny industries, small clinics and private practitioners are major contributors to illegal disposal of waste.

Health Hazards of the following nature are by and large inferred and experienced from the Bio-Medical Waste.

1. Injuries from ‘sharps’ to all categories of hospital personnel and waste handlers.
2. Nosocomial infections\(^\text{34}\) due to poor infection control and poor waste-management.
3. Risks of infections outside hospitals for waste handlers, scavengers and eventually, the general public.
4. Risks associated with hazardous chemicals, drugs when they are being handled by persons handling wastes at all levels.
5. Disposables like syringes etc., being repacked and sold without being even washed.
6. Drugs disposed off being repacked and sold to unsuspecting buyers.

Similarly, the following environmental hazards have been noticed and experienced because of improper handling and management of Bio-Medical Waste.

\(^{34}\text{Hospital-borne infections}\)
1. Toxic emissions like dioxins, furan gases and carbon, sulphur particles from defective/inefficient incineration.
2. Indiscriminate disposal of incinerator ash residues.
3. Leachate\textsuperscript{35} from improper waste treatment residues, leading to contamination of ground water.
4. Incinerators, which do not achieve high enough prescribed temperatures, actually end up producing toxic gases from plastics, because the temperature, at which they burn, is technically incorrect.

1.4 Mismanagement of Bio-Medical Waste

Bio-Medical Waste Management has become a major concern in today’s world. Human activities all over the world generate large amount of wastes. Rapid urbanization, industrial and technological innovations, which are responsible for generating large quantities of waste, have made waste management a difficult issue. But such waste has to be handled effectively to prevent its effects upon environment and human health.

The perils of medical waste first garnered attention in the late 1980s, when items such as used syringes washed up on several East Coast beaches in

\textsuperscript{35} The liquid that drains off from leaches, in a landfill.
USA lead to the law regulating medical waste. However in India the seriousness about the management came into lime light only after 1990s.

The Government of India had enacted some legislations and rules to protect the environment and health of people. Yet, they were not effectively changing the environmental scenario with environment being polluted and health of persons being at stake. Wastes were not being handled and disposed of safely. Even though there were good environmental laws, it was felt that the laws were not effective in protecting the environment and health of the people since policies prevented their effective implementation. The solution to this problem therefore was to provide specific rules for specific purposes by notifying such rules.

Since Bio-Medical Waste Management and handling has been given top priority in the overall ambit of public health hazards and since as always, any kind of regulation requires a legal back up, in this case too while recognising and endorsing the need for regulating Bio-Medical Waste Management and handling, the Government of India, while invoking and

36 See para 2.2 at p. 38
37 See para 3.10 at p. 137
38 For eg. The Water (Prevention & Control of Pollution) Act, 1974; The Air (Prevention & Control of Pollution) Act 1981; and The Environment (Protection) Act, 1986.
exercising power under Secs. 6, 8 and 25\textsuperscript{41} the Environment Protection Act, 1986, has enacted the Bio-Medical Waste (Management and Handling) Rules, 1998.\textsuperscript{42} These rules were amended twice in the year 2000 and once again in the year 2003.

As per these rules, the definition provided for ‘Bio-Medical Waste’ is that it 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 biologicals,\textsuperscript{43} and including categories mentioned in Schedule I of the said rules.\textsuperscript{44}

Medical wastes may be generated throughout healthcare facilities wherever medical procedures are conducted.\textsuperscript{45} The ill effects of poor management of Bio-Medical Waste have aroused concern all over the world especially due to its far-reaching effects on human health and environment. Moreover new hospitals are coming up at a mushrooming speed to meet the health hazards. The main cause for increase in quantity of medical waste is the shift from reusable items to disposable goods. The problem of medical waste has acquired gargantuan proportions and complex dimensions. On an

\textsuperscript{41} Sec. 6 deals with rules to regulate environmental pollution; Sec. 8 deals with persons handling hazardous substances to comply with procedural safeguards while Sec. 25 deals with power to make rules power to make rules.
\textsuperscript{42} Hereinafter also known as the BWM Rules
\textsuperscript{43} A term used to describe vaccines, cultures and other preparations made from living organisms and their products, intended for use in diagnosing, immunizing, or treating humans or animals, or in related research.
\textsuperscript{44} See Rule 3(5) BWM Rules, 1998
\textsuperscript{45} http://www.ul.com/eph/insights/ephiv4n4/med.html visited on 23.5.2006
average a hospital bed generates 1.25 kg of waste per day, out of which 10-15 per cent is infectious and rest is general waste. These quantities become unmanageable and the hospital prefers to throw them in municipal bins. General waste, which is rich in organic material, is a very strong media for the micro-organisms in infectious waste component of hospital waste. Thus one would give the micro-organisms good environs to multiply if the wastes are mixed. Exposure to health-care waste can result in injury or disease.

The Supreme Court of India has rightly observed in *Rural Litigation Entitlement Kendra v. State of U.P.* that, “The preservation of the environment and keeping the ecological balance unaffected is a task which not only the government but every citizen must also undertake. It is a social obligation and let every citizen be reminded that it is his ‘fundamental duty’ as enshrined in Article 51A of the Constitution”.

Thus, Bio-Medical Wastes are generated through healthcare facilities wherever medical procedures are conducted. Bio-Medical Wastes need safe disposal, since they pose hazard due to two principal reasons: the first is their intensity and the other, their toxicity. It is more dangerous than a chemical,

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46 AIR 1985 SC 652. Article 51A has been included as Chapter IVA in the Constitution of India vide The Constitution (Forty-second Amendment) Act 1972.

since Bio-Medical Waste can cause serious infections and incurable diseases.48

The medical waste is not being regulated satisfactorily in India. It is estimated that India generates around three million tonnes of Bio-Medical Waste every year and the amount is expected to grow at eight percent annually. Barring a few large hospitals in metropolitan cities, most of the other smaller hospitals and nursing homes have no effective system to safely dispose of their wastes. With no care or caution, these health establishments have been dumping waste in local municipal bins or even worse, out in the open. Surveys carried out by various agencies show that healthcare establishments in India are not giving due attention to dispose the waste properly.49 Thus Bio-Medical Waste Management is an area which needs proper attention because of its ill-effects upon the environment and human beings.

Rag-pickers and _safaikarmacharis_50 who rummage through this waste in search of disposables are also at great risk. They get exposed to the waste through any open wounds; inhalation of air borne pathogens and pricks by sharps, and all this makes them prone to infections. This improper handling, treatment and disposal of the Bio-Medical Waste leads to spreading of

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49 Ibid.
50 A term in Hindi, meaning subordinate staffs who are sweepers.
diseases such as HIV and Hepatitis, ocular, genital and skin infections. There may be anthrax, meningitis, hemorrhagic fevers, septicemia, bacterial and fungal infections, etc.

The present study aims to critically make a complete and comprehensive study of the problem of efficacy of the rules governing Bio-Medical Waste Management in the State of Goa, in order to find out lacunae in them and to suggest remedial measures and consequently to evolve an effective system of this waste management through a legislation specifically for the State of Goa.

1.5 Objectives of the Research

The objectives of the study are:

(i) To analyse the concept of Bio-Medical Waste, different kinds of such waste and to have a comprehensive understanding of its nature and

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51 This is an acute disease caused by the bacteria Bacillus anthracis. Most forms of the disease are lethal, and it affects both humans and other animals.
52 This is inflammation of the protective membranes covering the brain and spinal cord, known collectively as the meninges.
53 All types of VHF are characterized by fever and bleeding disorders and all can progress to high fever, shock and death in extreme cases.
54 Septicemia is a serious, life-threatening infection that gets worse very quickly. It can arise from infections throughout the body, including infections in the lungs, abdomen, and urinary tract.
55 There is strong epidemiological evidence from Canada, Japan and the USA, that the main concern of infectious hospital waste is the transmission of HIV/AIDS virus and, more often of Hepatitis B or C virus (HBV) through injuries caused by syringes contaminated by human blood.” Agarwal, Ravi. Medical Waste Issues, Practices and Policy: An Indian and International Perspective, New Delhi: Seminar on Health and the Environment, Centre for Science and Environment July 6-9th, 1998;
scope and the methods available to handle and dispose them in the State of Goa.

(ii) To analyse the problem of Bio-Medical Waste Management in the State of Goa and investigate the adequacy of law and efficacy of administrative agencies in effective handling and proper disposal of Bio-Medical Wastes.

(iii) To trace the international efforts for the management and handling of Bio-Medical Waste in view of the legal systems prevalent in the United States of America, the United Kingdom, Australia, Europe, Africa, Asia and south Asian countries with a view to have a broad perspective about the legal control of such waste management at the international level.

(iv) To trace the concerns of the legal system in India from ancient times in terms of waste management generally and to analyse the modern laws and rules promulgated in India relating to management and handling of Bio-Medical Wastes.

(v) To study the methods of treatment and disposal of Bio-Medical Waste in the various healthcare establishments in the State of Goa and to investigate and evaluate the deficiencies present in them.

(vi) To analyse the existing rules and regulations pertaining to the management and handling of Bio-Medical Wastes for their efficacy, especially in the context of enforcement and feasibility.

(vii) To examine the role of the higher judiciary in contributing to the development of environmental jurisprudence and the legal control of Bio-
Medical Waste Management, generally as also with particular reference to the State of Goa.

(viii) To make suggestions and recommendations for better Bio-Medical Waste Management in terms of specific legislation for the State of Goa and consequently to protect the environment and health of the public.

1.6 Hypotheses Postulated

(i) Healthcare institutions function in gross violation of the existing Bio-Medical Waste (Management and Handling) Rules, 1998 thereby posing dangers to in-patients, visitors and the public at large.

(ii) The Bio-Medical Waste (Management and Handling) Rules, 1998 suffer from certain basic shortcomings. As a result they have become ineffective in protecting the environment generally and health of the people in particular.

1.7 Methodology used in Research

Besides review of literature and studies which are related to Bio-Medical Waste Management,56 this study involves an exhaustive empirical research primarily through survey method, by collecting data

56 See Bibliography.
through several techniques of providing survey forms, completing questionnaires and conducting informal interviews of different respondents ranging from healthcare institutions, doctors, nursing staff, auxiliary staff, randomly selected patients and visitors, officials of the Goa State Pollution Control Board and representatives of Non-Governmental Organizations. Site visits were also undertaken to examine several aspects of Bio-Medical Waste Management.

Original sources on the subject, like national legislations, rules and regulations have been identified by visit to several libraries in the State of Goa and in several other States in India and these have been tested and verified in accordance with the objectives of this research. Secondary sources that are of concern to the present research have been looked into by personally attending seminars, interaction with other researchers personally and corresponding with authors of various articles from several States in India. Such sources have also been tested and verified to the extent applicable to the present research.

1.8 Importance of the Study

Production of Bio-Medical Waste in large quantities is an inevitable side effect of modern scientific and medical advancements and nothing much

57 All data and findings incorporated in Chapter 4.
can be done to alter that. The treatment and disposal of such type of waste, however, is an extremely relevant and sensitive issue, because it involves questions related to environment pollution and public health hazards. In this context there was a pressing need to formulate rules for the management and handling of such wastes in order to scientifically standardize all practices in this regard.

The importance of the study lies in the fact that it analyses the problems associated with Bio-Medical Wastes and suggests remedial measures to tackle the problem of Bio-Medical Waste Management. The research and consequent suggestions and recommendations including a proposal for a specific legislation for the State of Goa are believed to be useful to legislators. Administrators of healthcare establishments, academicians, lawyers and non-government organizations will also benefit from this study. The importance of the study lies in its purpose of making an original contribution to the discipline of law.

1.9 Limitations of the Study

The following are the limitations of the study:

Firstly, since the area relating to Bio-Medical Waste Management is very large, only the problems created by such wastes generated in the area of human healthcare management are investigated with reference to relevant
legal norms. Other forms of Bio-Medical Wastes generated through ways and means unconnected with human healthcare management like originating from research activities, veterinary care and healthcare establishments of the Armed Forces under the Ministry of Defence, although important in their own way, have not been dealt with in the present study, primarily since their contribution to the problem of Bio-Medical Waste Management is to a miniscule extent.

Secondly, the researcher has kept outside the purview of this study in all aspects of Bio-Medical Waste Management in respect of healthcare establishments under the defense forces, although the Bio-Medical Waste Management Rules equally apply to them. The task of obtaining empirical data and on-the-spot studies in such places would entail a lot of practical difficulties, as entry into such places is restricted or controlled.

1.10 Scheme of the Study

The writing and documentation of this research has been done in accordance with the standard guidelines for graduate students, scholars and research writers, wherein the content notes are composed as foot notes. The study is arranged into a scheme which underlines the relevance of the problem and its setting in the context of the environment as explained in this chapter.
This Chapter has underlined the meaning of waste generally and the special place of Bio-Medical Wastes amongst other wastes. The problems of mismanagement of Bio-Medical Wastes have been elaborated and the objectives, limitations and need for the study of the legal control of Bio-Medical Waste Management are the contents of this Chapter.

The Second Chapter examines the international legal machinery, which includes the legal systems of Bio-Medical Waste Management in the United States of America, United Kindgom, Western Australia, Europe, South Africa, Asia and the south Asian countries, most of which are neighbours to the Indian sub-continent.

The specific rules for management and handling of Bio-Medical Waste in India from ancient times till the present, along with the amendments including the specific judicial response in this regard are the contents of the Third Chapter.

The implementation of the rules and procedures for proper handling of Bio-Medical Wastes and the Goan experience with regard to the problems of Bio-Medical Waste mismanagement across a spectrum of healthcare institutions, which involves voluminous information gathered through various
means and subject to statistical techniques using Microsoft Excel,\textsuperscript{58} has been thoroughly discussed in the Fourth Chapter.

Finally, the importance, use and purpose of this study have been kept in mind and an evaluation of the data and findings gathered from the different aspects of research methodology at hand has been concluded. This has been done by keeping in mind the objectives of this research and it has involved assessment of the salient aspects of information generated through research tools as recorded in the Fourth Chapter. This study has critically analysed the deficiencies in infrastructure of the healthcare establishments based upon the findings arrived at from the respondents in the study. The suitability of the provisions of law in the context of Bio-Medical Waste Management and their implementation is examined in this research, based on which suggestions and recommendations are made for effective management of Bio-Medical Wastes. Accordingly, the concluding remarks have formed the closing component of this research study in the Fifth and final Chapter.

\textsuperscript{58} It is an office suite of interrelated desktop applications, servers and services for the Microsoft Windows operating system.