

## CHAPTER VIII

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

The issues concerning the ill effect of the Bio-Medical Waste and its impact on the environment has been of recent development in the international field and the outcome is the enactment of various laws by the countries of the world, the root of which could be found in the Stockholm Conference, a milestone towards combating different environmental issues including the Bio-Medical Waste. Being the new subject in the field of environment, in no such Conventions and Conferences held during the past, the key issue was on the bio-medical waste. The Basel Convention held in 1989 had for the first time highlighted on the importance of managing various types of wastes which also includes the waste arising from hospital industries. But no such drastic steps were accorded to meet the challenge; eventually the conferences helped the countries to consider the issue seriously in near future. It is reported that for the first time the bio-medical waste issue was discussed at a meeting convened by the World Health Organisation (WHO) Regional Office for Europe at Bergen, Norway in the year 1983<sup>1</sup>. With the passage of time, the problem has evolved as a global humanitarian issue and there came into existence various types of regulatory laws in different parts of the world including India to manage and control the same in their own way and thereby would help the countries in adopting proper steps towards complete eradication of the problem relating to the waste. The question that arises is whether the existing law of the respective countries is comprehensive within the framework of which such problem could properly be handled or the insufficiency in the laws without making major amendments would leave the question unanswered as to where we are pushing ourselves whether it is in such a world where “cleanliness is next to the Godliness” or in a world of dumping ground, where the very existence of the human being in such a world is becoming next to impossible? Another pertinent question is how to judge an existing law incomplete where the social standard varies

---

<sup>1</sup> A. Sreejith, “Hygiene and Bio-Medical Waste Management plan for healthcare environmental setting: A study with special focus on Kerala, India” pg. 9 (2008), *Available at:* <https://www.scribd.com/doc/8107661/Bio-Medical-Waste-Management-Hygiene-in-Healthcare-Environment> (Last visited on Dec. 2, 2016).

from countries to countries and it is difficult to adopt a uniform measure worldwide due to higher cost of the equipments that are being use to dispose of such waste? Therefore, in search of the above mentioned quests, it is important to focus on the existing laws of different country relating to the subject in order to reach to a conclusion as to whether the existing law of India is self sufficient or some major changes is required to meet and handle the problem properly and effectively. The present Chapter examines the laws on bio-medical waste of few developed countries who, to some extent are successful in tackling the ill effect of such waste on environment. The analysis of the laws of different countries would not only help the researcher to find out major defects in our laws, it would also help in finding out the measures the adoption of which would help in sorting out the problem to a large extent.

## **8. Bio-Medical Wastes (BMW) Management in the Developed Countries**

Few countries of the world have specific legislation to deal with the management and handling of bio-medical waste. The study has revealed information about the legal mechanisms prevalent in the United States of America, United Kingdom, Australia, South Africa, Europe, Asian and South Asian countries, all of which have legislative enactments of different types to deal with bio-medical waste management. Some of such laws of some of these countries have been discussed herein below.

### **8.1 The United States of America (USA)**

The recent hue and cry relating to the problem of BMW in America could be understood from numerous incidents taken places in the recent past that can be referred to in order to understand the BMW scenario in the country. The first of such incident took place in a New York City in 1986 where one thousand four hundred bags of medical waste were dumped illegally. Surprisingly, it was reported that the same had been incinerated. Again, in June 1987, twelve children from Indianapolis, Indiana were found playing with vials of blood outside a health medical office. After testing the same it was found that two of the vials were infected with the AIDS virus. It is interesting to note that at that time it was completely valid for these types of waste to be disposed of in an open dumpster. And in 1988, a New Jersey garbage slick

a mile long, composed of syringes and empty prescription bottles with New York addresses, was the first of many medical waste wash-ups on beaches along the east coast from Maine to Florida, the west coast, the Great Lakes, and the Gulf Coast. These beaches were temporarily closed<sup>2</sup>. To add, it is to be noted that the discharge of a pollutant into the navigable waters of the United States is prohibited unless compliance is achieved under the provisions of the Clean Water Act (CWA)<sup>3</sup>. This incident not only closed many of the beautiful beaches along the coast but, more shockingly, instilled a great public fear of a new health hazard. Although illegal dumping of medical waste appears to pose no serious threat to our beaches, the 1987 beach scare showed the public that without proper regulations, medical waste could be dumped in anyone's backyard<sup>4</sup>. It is ironical that despite the recent publicity and outrage over the medical waste issue, the 1988 beach wash-ups were less of a medical waste disposal problem than the public was led to believe. Only 0.1% of the total debris collected in 1988 from the coastal states was plastic syringes, with a total of 1% constituting general medical waste<sup>5</sup>. Out of the total BMW generated in hospitals in USA, most of them are solid waste and infectious medical waste constitutes only ten to fifteen percent. Despite less in percentage, in 1988, the federal Center for Disease Control determined that at least 18,000 people annually contract hepatitis-B through accidental exposure to medical waste involving infectious waste. Each year up to 200 to 300 health care workers die from hepatitis-B<sup>6</sup>. The table below shows the detail of total healthcare waste and infectious waste generated in the USA.

---

<sup>2</sup> Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol. 14 *Northwestern Journal of International Law & Business* pg. 206 (1993).

<sup>3</sup> Ann M. Babigian, "Medical Waste, a Loaded Gun on the Verge of Firing" Vol. 13 *Pace Environmental Law Review* pgs.1063-64 (1996).

<sup>4</sup> Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 *Fordham Environment Law Review* pg.103 (2011).

<sup>5</sup> Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol.14 *Northwestern Journal of International Law & Business* pg. 206 (1993).

<sup>6</sup> Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 *Fordham Environment Law Review* pg.105 (2011).

**Table 1**

**Total healthcare and infectious waste generation by type of health-care facility: high-income country (United States of America)<sup>7</sup>**

<b>Type of healthcare facility</b>	<b>Total healthcare waste generation</b>	<b>Infectious waste generation</b>
Metropolitan general hospitals	10.7 kg/occupied bed/day	2.79 kg/occupied bed/day
Rural general hospitals	6.40 kg/occupied bed/day	2.03 kg/occupied bed/day
Psychiatric and other hospitals	1.83 kg/occupied bed/day	0.043 kg/occupied bed/day
Nursing homes	0.90kg/occupied/day	0.038 kg/occupied bed/day
Laboratories	7.7 kg/day	1.9 kg/day
Doctor's office (group practice, urban)	1.78 kg/physician-day	0.67 kg/physician-day
Doctor's office (individual, urban)	1.98 kg/physician-day	0.23 kg/physician-day
Doctor's office (rural)	0.93 kg/physician-day	0.077 kg/physician-day
Dentist's office (group practice)	1.75 kg/dentist-day	0.13 kg/dentist-day
Dentist's office (individual)	1.10 kg/dentist-day	0.17 kg/dentist-day
Dentist's office (rural)	1.69 kg/dentist-day	0.12 kg/dentist-day
Veterinarian (group practice, metropolitan)	4.5 kg/veterinarian-day	0.66 kg/veterinarian-day
Veterinarian (individual, metropolitan)	0.65 kg/veterinarian-day	0.097 kg/veterinarian-day
Veterinarian (rural)	7.7 kg/veterinarian-day	1.9 kg/veterinarian-day

Under the above circumstances, there is an urgent need to focus on various laws, regulations, guidelines etc. in existence in the country relating to the BMW that aimed in reducing such waste to the minimum. The knowledge of such laws etc. would help in understanding the subject in a far better way on the basis of which proper steps could be suggested to tackle the same in our country. An analysis of the various laws, regulations is made here in below to achieve such purposes.

<sup>7</sup> Yves Chartier, *et. al.*, "Safe management of wastes from health-care activities" World Health Organisation, pg. 3 (2nd Edn., 2014).

### 8.1.1 Medical Waste Tracking Act, 1988 (MWTA)

Medical waste was first formally recognised as a distinct waste stream by a federal agency in 1978 when the Environmental Protection Agency (EPA) considered classifying infectious waste as hazardous waste under the Resource Conservation Recovery Act (RCRA), 1976<sup>8</sup>. In fact, when EPA first proposed hazardous waste regulation, infectious wastes were included in it. However, in 1979, the agency determined that infectious wastes did not pose a significant health threat, and when EPA promulgated its RCRA hazardous waste regulations in 1980, it chose not to classify infectious waste as hazardous. However, EPA decided to treat medical waste as solid waste and the agency never issued the proposed regulations<sup>9</sup>.

To quell the public's fear of improper medical waste disposal, Congress hastily enacted a two-year demonstration program - The Medical Waste Tracking Act (MWTA) in 1988 by way of amending RCRA adding subtitle J. The MWTA expired in June 1991. It also added a demonstration programme to RCRA, and EPA promulgated implementing regulations<sup>10</sup>. The Act was implemented in New York, New Jersey, Connecticut and Rhode Island and states bordering the Great Lakes<sup>11</sup>.

The purposes of MWTA were:

- to provide a system to track medical waste to its disposal.
- to provide a system to assure generators that waste is ultimately received by the proper disposal facility and
- to provide a standard form of tracking waste within the applicable states<sup>12</sup>.

The four main features<sup>13</sup> of the Act are:

- a definition of medical waste,
- a tracking system similar to that for hazardous wastes,

---

<sup>8</sup> Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 521 (1994).

<sup>9</sup> *Ibid* at pg. 526.

<sup>10</sup> *Ibid* at pg. 522.

<sup>11</sup> Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol. 14 Northwestern Journal of International Law & Business pg. 215 (1993).

<sup>12</sup> *Ibid*.

<sup>13</sup> Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 544 (1994).

- information gathering power and requirements and
- enforcement capability.

#### **8.1.1.1 Definition of Medical Waste**

The MWTA defined medical waste<sup>14</sup> as cultures and stocks of infectious agents, pathological wastes, waste human blood and products of blood, used sharps, contaminated animal carcasses, body parts and bedding of animals that were exposed to infectious agents, wastes from surgery or autopsy that were in contact with infectious agents, laboratory wastes that were in contact with infectious agents, dialysis wastes, discarded medical equipment previously in contact with infectious agents, biological waste and discarded materials contaminated by humans or animals isolated to protect others from communicable diseases, and any other waste that the Administrator believed posed a threat to human health or the environment<sup>15</sup>.

The Act laid down that the tracking of Bio-Medical Waste should be made following the cradle to grave method which involved generation to disposal of such waste in a systematic manner. For this purpose the generators, handlers, transporters etc. were required to fill out forms which allowed the Environment Protection Agency to monitor Bio-Medical Waste irrespective of large or small generators unless exempted<sup>16</sup>. The Act also provided that all generators had to segregate Bio-Medical Waste into sharps, fluids, and other waste and to be stored into the specific containers as part of the packaging requirements. Such containers must fulfil the criteria as provided in the Act which included that it must be rigid, leak-resistant, impervious to moisture, strong enough to prevent tearing or bursting under normal conditions of use and handling, and sealed to prevent leakage and to be protected from water, rain and wind and if it was stored outdoors the waste had to be locked to prevent unauthorised access by humans or animals<sup>17</sup>.

Finally, the generators had to label untreated regulated medical waste as either “medical waste” or “infectious” or display the universal biohazard symbol before transport. In addition, the generator had to mark the packages with its name, its state

---

<sup>14</sup> Section 6992 of the Medical Waste Tracking Act, 1988, USA.

<sup>15</sup> Wendy Stynes, “Safeguarding Our Health: Developments in the Management of Medical Waste” Vol. 4 Fordham Environment Law Review pg.107 (2011).

<sup>16</sup>*Ibid* at pg. 109.

<sup>17</sup>*Ibid*.

permit or identification number, the transporter's name, the transporter's state permit or identification number, the date of shipment, and identify the contents as medical waste. Furthermore, inner containers had to display the generator's name and state permit or identification number<sup>18</sup>.

#### **8.1.1.2 Enforcement Machinery**

The establishment of enforcement machinery under the enforcement scheme was an important step and was modelled on the Solid Waste Disposal Act (SWDA). It authorised Environment Protection Agency employees to enter into the generator, storage, treatment, transportation and disposal site at reasonable times to inspect the premises and obtain samples of medical waste. If the Administrator discovered a violation he could have imposed a civil penalty which could not have exceeded \$ 25,000 per day of non-compliance or brought a civil suit in the United States District Court. The potential for such high fines communicated that it was more expensive to pollute than to legally dispose of the medical waste<sup>19</sup>.

Anyone, who violated the requirements of the Act by knowingly omitting material information or made false statement or representations could be subject to criminal penalties, apart from the civil liability by the imposition of fine amounting to not more than \$50,000 for each day of violation, or imprisonment not to exceed two years. In addition, any person who knowingly committed the above mentioned violations and knew that at that time he was placing another person in imminent danger of death or serious bodily injury upon conviction would have been subject to a fine of up to \$250,000 or imprisonment for a maximum of fifteen years, or both. An organisation convicted under the MWTAA could have been subjected to a fine of not more than \$1,000,000<sup>20</sup>.

The Act also imposed a high cost for the transportation and disposal of Bio-Medical Waste without any measureable benefits. For example, in order for a New York hospital to comply with MWTAA, the amount of waste that became regulated under the Act increased by 315% between 1984 and 1989, and its total costs went up

---

<sup>18</sup> *Ibid.*

<sup>19</sup> *Ibid.*

<sup>20</sup> *Ibid* at pg. 110.

nearly 700%. This dramatic increase is largely due to the huge cost differential between disposing of non-regulated medical waste and regulated medical waste<sup>21</sup>.

In spite of its perceived shortcomings, the MMTA has produced beneficial effects. It has contributed to our knowledge of the medical waste stream and will help identify new areas of concern. The program could help in the formulation of a uniform definition of medical waste. In addition, enforcement, inspection and tracking systems could serve as a future model, even if Congress decides medical waste should be left wholly within state purview<sup>22</sup>.

### **8.1.2 The Clean Air Act, 1990**

This Clean Air Act is important from the disposal point of view because high percentage of the Bio-Medical Waste is incinerated in USA following different incineration mechanisms. Historically, incineration was the only method of treatment accepted by regulators for infectious waste because it offers total destruction, providing an aesthetic benefit and reducing solid waste disposal cost<sup>23</sup>. Although incineration accounts for more than 75 percent of the total medical waste treated, while most of the remaining medical waste is autoclaved,<sup>24</sup> it is subject to some disadvantages. For example, dioxin and furan emissions are of particular concern during the incineration process. Furthermore, ash, an incineration by-product, contains hazardous substances, and it is frequently disposed of under open conditions in landfills. As under RCRA, there have been several bills introduced in recent months to address the need for a regulatory program for air emissions from medical waste incinerators<sup>25</sup>. The Clean Air Act Amendments of 1990 specifically address solid waste combustion, and because medical waste is currently considered solid waste, it is covered by the statute. Section 129 of the Clean Air Act Amendments of 1990 requires Environment Protection Agency to develop New Source Performance Standards (NSPS) and Emission Guidelines (EGs) for four classes of solid waste

---

<sup>21</sup> *Ibid.*

<sup>22</sup> Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 551 (1994).

<sup>23</sup> *Ibid* at pg. 559.

<sup>24</sup> *Ibid* at pg. 561.

<sup>25</sup>Christina Luise Martini, "Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform" Vol. 14 Northwestern Journal of International Law & Business pg. 217 (1993).

incineration units: municipal waste combustors, medical waste incinerators, industrial and commercial waste incinerators and categories of other solid waste incinerators<sup>26</sup>.

The Section provides that, Environment Protection Agency must establish numerical limits for emissions of acid gases (sulfur dioxide and hydrogen chloride), particulate matter, opacity, metals (cadmium, lead, and mercury), organics (dioxins/furans), carbon monoxide, and nitrogen oxides from solid waste incineration units. The NSPS and EGs for other types of incinerators, including medical waste incinerators, are to be developed under separate rulemaking actions.

### **8.1.3 The Clean Water Act (CWA), 1992 and the Marine Protection, Research and Sanctuaries Act (MPRSA) 1992**

Enacted during the same year, both the Acts are confined to the matter regulating the discharge and disposal of the Bio-Medical Waste. The Acts have been aimed at protecting not only surface water from degradation from improper medical waste disposal, but they may also prevent beach wash-ups and closings, which are occurring with more frequency<sup>27</sup>. The CWA makes it an offence for any person to discharge a pollutant into navigable waters from ‘a point source’<sup>28</sup>.

Popularly known as the Ocean Dumping Act or the Ocean Dumping Ban Act, the purpose of the MPRSA is “to regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems or economic potentialities.”<sup>29</sup> Medical waste is specifically addressed under the MPRSA and is discreetly defined<sup>30</sup>. The Act

---

<sup>26</sup> Laura Carlan Battle, “Regulation of Medical Waste in the United States” Vol.11 Pace Environmental Law Review pg. 562 (1994).

<sup>27</sup> *Ibid* at pg. 554.

<sup>28</sup> ‘A point source’ is defined in § 1362(14) as “any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged”.

<sup>29</sup> Laura Carlan Battle, “Regulation of Medical Waste in the United States” Vol.11 Pace Environmental Law Review pg. 557 (1994).

<sup>30</sup> According to the Marine Protection, Research and Sanctuaries Act, 1992, medical waste includes isolation wastes, infectious agents, human blood and blood products, pathological wastes, sharps, body parts, contaminated bedding, surgical wastes and potentially contaminated laboratory wastes, dialysis wastes and additional items prescribed by regulation.

prohibits ocean dumping of medical waste, radiological, chemical, and biological warfare agents, and radioactive waste.

For each violation, civil penalties of up to \$50,000 can be assessed for violating the Act, its implementing regulations, or a permit. In addition, any person who violates the Act by “engaging in activity involving the dumping of medical waste” is liable for a civil penalty of up to \$125,000 for each violation. A knowing violation can result in criminal penalties of up to \$50,000 or imprisonment for one year, or both, and knowingly engaging in activity involving dumping medical waste into ocean waters can result in a \$250,000 fine or imprisonment for up to 5 years, or both<sup>31</sup>.

## **8.2 Federal Regulations**

Federal regulations are specific details directives or requirements with the force of law enacted by the federal agencies necessary to enforce the legislative acts passed by Congress<sup>32</sup>. The following are the examples of the Federal Regulations including the Clean Air Act as discussed above.

### **8.2.1 Occupational Safety and Health Administration (OSHA) Acts, 1970 and Regulations**

The Act was passed for ensuring safe and healthy working conditions of those workers working in the USA. The principal function of the OSHA is to promulgate and enforce workplace safety and health standards of the workers. The Act also provides for the enforcement of standards developed under the Act and to assist and encourage the States in their efforts to assure safe and healthful working conditions among others which deserve special mention. Under the OSHA, the Secretary of Labour has express power to regulate the handling and disposal of medical waste and to promulgate standards necessary to assure the “attainment of the highest degree of health and safety protection of the employee.”<sup>33</sup>

---

<sup>31</sup> Laura Carlan Battle, “Regulation of Medical Waste in the United States” Vol.11 Pace Environmental Law Review pgs. 558-559 (1994).

<sup>32</sup> Robert Longley, Federal Regulations, The Laws Behind the Acts of Congress, (Nov. 26, 2016).

<sup>33</sup>Christina Luise Martini, “Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform” Vol. 14 Northwestern Journal of International Law & Business pg. 218 (1993).

There are generally four OSHA standards which address infectious waste issues in the workplace<sup>34</sup>. OSHA predicted that implementation of the standard could prevent approximately 200 deaths and 9,200 bloodborne infections per year. Therefore, hospitals tend to be the institutions most frequently subject to its standards<sup>35</sup>. The first of such standard is OSHA's Emergency Response Standard which requires every employer to supply employees with information on proper actions during an emergency, where emergency equipment is located, how to use it and a location outside of the building where employees will meet after evacuating. Secondly, OSHA's Hazard Communication Standard requires employers to develop a written program which lists all hazardous chemicals used in the medical facility, their physical and chemical ingredients, where they are used, the type of hazard associated with their use, and other related information including the name, address and telephone number of a responsible party who can provide information and emergency procedures for the hazardous chemical. Thirdly, OSHA's Chemical Hygiene Standard requires employers to establish written policies for procedures, equipment, personal protective equipment and work practices which will effectively protect employees from hazardous chemicals in their facilities and finally, promulgation of a bloodborne Pathogen Rule requiring employers to protect workers from exposure to bloodborne pathogens. The Standard on Occupational Exposure to bloodborne pathogens, effective as of March 6, 1992, is the first set of rules that OSHA has issued in the health care industry. The regulations cover an estimated 4.9 million health care workers and 700,000 Americans who routinely handle blood or bodily fluids on the job<sup>36</sup>. The regulations deal only with the handling of medical waste; they do not mandate any procedures regarding medical waste treatment or disposal. The purpose of the Standard is to reduce the chance of workers contracting disease because of exposure to medical waste.

---

<sup>34</sup> Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pgs. 571-572 (1994).

<sup>35</sup> Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 Fordham Environment Law Review pg. 119 (2011).

<sup>36</sup> *Ibid* at pg. 118.

### **8.3 Guidelines**

Guidelines are ready reference tool for medical waste management. It attempted specifically to answer the day-to-day questions for the management of such waste which would help in protecting public as well as the environment from injury due to the spread of infection. It acts as a guide to state regulations or act as guidance as to what a hospital must do in order to meet the circumstance. The following guidelines are important from the BMW point of view.

#### **8.3.1 The Environment Protection Agency (EPA) Guidelines**

Since the expiration of the MWTAA, this Environment Protection Agency guide represents the agency's current perspective on acceptable infectious waste management practices. It addresses infectious waste characterisation, infectious waste management, treatment of infectious wastes, and recommendations for development of an infectious waste management plan. It is designed to guide those persons responsible for managing infectious waste at facilities such as hospitals, laboratories, animal experimentation units, industrial plants, biotechnology companies, and others which generate infectious wastes<sup>37</sup>.

One of the most significant aspects of the guide is Environment Protection Agencies definition of infectious waste as waste capable of producing an infectious disease, taking into account four factors:

- presence of a pathogen of sufficient virulence,
- dose,
- portal of entry, and
- resistance of the host.

The definition provided in the guidelines has been adopted by many states and agencies regulating medical waste; however, it is nonbinding at the federal level<sup>38</sup>. The guide has been criticised on two grounds. First, because EPA was uncertain of the health risks posed by infectious wastes, it failed to set forth a minimum national

---

<sup>37</sup>Laura Carlan Battle, "Regulation of Medical Waste in the United States" Vol.11 Pace Environmental Law Review pg. 579 (1994).

<sup>38</sup> *Ibid.*

standard for the management and disposal of infectious waste. Secondly, the guide technically satisfies RCRA's objective of providing information, but it may have added to the confusion surrounding the risk associated with infectious waste by not providing a basis for interstate control.

### **8.3.2 Center for Disease Control (CDC) Guidelines**

The CDC is a federal public health agency charged with the surveillance and investigation of infectious diseases in hospitals. It collects weekly, monthly and yearly statistics on many infectious diseases and on control programs for health care facilities. The Agency also makes recommendations necessary for disease control. The 1987 "Recommendations" suggested that "universal precautions" relating to blood and body fluid be consistently used for all patients regardless of their blood borne infection<sup>39</sup>. These "precautions" apply primarily to health care workers and medical institutions; consequently, the guidelines reach the generators of infectious waste and their on-site handling and treatment, and have not had as much impact as the EPA guidelines on medical waste removal and disposal.

The CDC found that annually over 2,100 workers contract hepatitis-B, between 400-440 of those infected require hospitalisation, and approximately 200 die<sup>40</sup>. The CDC focuses its energies on medical institutions and generators of infectious waste. The guideline envisages the urgency of correct labeling of infectious waste which is classified on the basis of the risk of disease transmission. It also highlighted that human health and environmental safety depends on the regulation of the infectious waste because of the risk factors involved in it. Due to the lack of uniform federal regulation, many states have taken it upon themselves to promulgate their own legislation for intra-state waste disposal.

Therefore, it can be said that the steps which has been undertaken is an earnest attempt to meet the medical waste issues, there are variations in the regulations because each state addresses its own particular needs through its own legislative process. However, it has been seen that not enough time is found to perform the necessary analysis before the standards are adopted, and the necessity of such

---

<sup>39</sup> *Ibid* at pg. 580.

<sup>40</sup> Wendy Stynes, "Safeguarding Our Health: Developments in the Management of Medical Waste" Vol. 4 Fordham Environment Law Review pg. 119 (2011).

regulation is often left undisputed. Furthermore, some states regulate on the basis of listed generators versus types of waste generated, which can lead to high requirement differentials between states and regulation targeted at inappropriate sources. Moreover, stricter regulations in one state may encourage the shipment of waste to other states with less stringent regulations. This is another reason why a national standard which establishes a regulatory baseline is favorable that would help in reducing transportation costs<sup>41</sup>.

#### **8.4 Bio-Medical Waste Management in New York State and City: Current Scenario**

“Waste is not an inevitable result of production, but rather a measure of its inefficiency.” Joseph Romm, an American author and physicist<sup>42</sup>.

Medical waste and its proper disposal remain a major concern for America. The amount of medical waste generated increases every year as medical technology improves and as the population grows older. In 2010, an estimated 5.9 million tonne of waste were produced in hospitals in USA. More recent estimates place the number at 6,600 pounds of waste per day or 2.4 million tons per year<sup>43</sup>. Every day 33 pounds of medical waste generated per staffed bed in such hospitals. It is estimated that Florida alone has approximately 38,000 facilities that generated biomedical waste<sup>44</sup>. In 2012, the United States spent up to \$2.5 billion for the proper disposal of medical waste. Moreover, with annual growth of 4.8%, by 2017 the annual market is expected to \$3.2 billion<sup>45</sup>.

The existing scenario of the New York City is no better. Consisted a population of 8,550,405, the city is the most populous in the United States. The city is different from the New York State and the premier gateway for legal immigration to the United States. The New York City Metropolitan Area is one of the most populous

---

<sup>41</sup>Christina Luise Martini, “Medical Waste Regulation in the United States: A Dire Need for Recognition and Reform” Vol. 14 Northwestern Journal of International Law & Business pgs. 218-219 (1993).

<sup>42</sup>Ryan M. Kania and Jordan B. Markel, “An Approach to Mitigating Excess Medical Waste” (December, 2010), *Available at:* <http://honors.usf.edu/documents/thesis/u91904693.pdf> (Last visited on Dec. 26, 2016).

<sup>43</sup>*Ibid.*

<sup>44</sup>Intan Airlina, “Medical Waste Disposal: The Definitive Guide,” *Available at:* <http://www.biomedicalwastesolutions.com/medical-waste-disposal/> (Last visited on Dec. 28, 2016).

<sup>45</sup>*Ibid.*

urban agglomerations in the world. New York City is a global city, exerting a significant impact upon commerce, finance, media, art, fashion, research, technology, education, and entertainment, its fast pace defining the term New York minute<sup>46</sup>. New York State has provided regulatory oversight of Regulated Medical Waste (RMW) since the early 1980s and has adopted a comprehensive regulatory framework covering all aspects of handling, storage, treatment and disposal of the regulated medical waste. Title 15 of Article 27 of the Environmental Conservation Law, 6 New York Codes, Rules and Regulations (NYCRR) Sub-parts 360-10 and 360-17, and Part 364 regulations, in conjunction with the Public Health Law 1389 aa-gg and 10 NYCRR Part 70 govern the activities of the New York State regulated community to properly manage RMW<sup>47</sup>. The New York statutory and regulatory programs that control all or some of the aspects of the generation, transportation, treatment and disposal of medical waste were originally modeled after the now-defunct federal Medical Waste Tracking Act. There are two principal regulators of the treatment and disposal of medical waste in New York. The New York State Department of Environmental Conservation regulates the transportation, storage, treatment and disposal of medical waste and sets performance standards for medical waste incinerators. The New York State Department of Health regulates the storage, treatment and disposal of medical waste which takes place on-site at facilities licensed. These new regulations set in motion a process to ensure regulated parties continue to upgrade their regulated medical waste practices.

The only federal rules related to regulated medical waste are concerned with packaging for RMW interstate transport (U.S. Department of Transportation Regulations) and handling of blood borne pathogens (Occupational Safety and Health Administration Regulations) in occupational settings. In addition, other federal laws e.g., the Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act; and, the Clean Air Act and regulations e.g., U.S. Postal Service; Food and Drug Administration; U.S. Department of

---

<sup>46</sup> Department of City Planning, New York City Population, Population Facts, New York City Planning, *Available at:* <https://www1.nyc.gov/site/planning/data-maps/nyc-population/population-facts.page> (Last visited on Dec. 31, 2016).

<sup>47</sup>New York State, Department of Environmental Conservation, "Regulated Medical Waste", *Available at:* <http://www.dec.ny.gov/chemical/8789.html> (Last visited on Jan.2, 2017).

Agriculture; and, U.S. Public Health Service govern the handling, transport and disposal of certain components of regulated medical waste<sup>48</sup>.

There are approximately 36,000 generators of RMW and 250,000 tons of RMW generated each year in New York State. One third of this volume is attributed to healthcare facilities such as nursing homes, hospitals, and clinical laboratories, while the other two thirds is generated by physician offices, blood establishments, colleges and universities, veterinarian and dental offices, funeral homes, research laboratories, pharmaceutical and biotechnology facilities<sup>49</sup>.

The Department of Health has undertaken a separate programme on improperly disposition of hypodermic needles and syringes which involve the risks of injury due to accidental needlesticks which results in the transmission of bloodborne infections, including hepatitis B and C, and human immune deficiency virus. In the USA at present an estimated three billion syringes are used annually for self-administration of medications and illicit drugs<sup>50</sup>. Under the programme the Department has offered technical assistance, distributed educational materials, and created Web-based resources to foster development of community-based collection sites. To expand syringe collection by pharmacies, “Guidelines for Pharmacies Interested in Accepting Sharps for Safe Disposal” offered advice on navigation of legal and regulatory requirements pertaining to the collection of used syringes. As of January 2007, there were 1,023 syringe collection sites, of which 245 (23.9%) were hospitals, 653 (63.8%) were nursing homes, 46 (3.6%) were other health-care facilities, and the remaining 79 (7.7%) were community-based collection sites<sup>51</sup>. In clinical chemistry laboratories, data from seventy New York hospitals listed needle puncture (103 cases), acid or alkali spills (46), glass cuts (44), splash in eye (19), and bruises and cuts (45) as the most frequent exposures (21). Needle puncture, glass cuts,

---

<sup>48</sup> *Ibid.*

<sup>49</sup> *Ibid.*

<sup>50</sup> Susan J. Klein *et. al.*, “Increasing Safe Syringe Collection Sites in New York State” Public Health Report, pg. 123 (Jul-Aug, 2008), Available at: [www.ncbi.nlm.nih.gov/pmc/articles/PMC2430639/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2430639/) (Last visited on Jan. 2, 2017).

<sup>51</sup> *Ibid.*

splash in eye, and bruises and cuts have the highest potential for infection from microbes<sup>52</sup>.

To make effective management of bio-medical waste steps have been undertaken by various hospitals in New York City to use new technological disposal methods that is eco-friendly and cost effective. Lincoln hospital is the only hospital in the city that has pioneered innovative eco-friendly and cost effective systems to safely dispose of bio-medical waste. The use of rotating autoclave technology to sterilise and grind up regulated medical waste on-site, protecting healthcare employees, other field professionals and the public as well as safeguarding the environment is an important steps in this connection. Utilising this state-of-the-art rotating autoclave machine, regulated medical waste such as sharps and other bio-hazardous material is sterilised, ground into confetti-like particles and disposed off as treated medical waste, in accordance with New York State guidelines. The autoclave machine reduces the volume of medical waste by about 80 percent and led to a savings in the treatment and removal of medical waste of \$42,000 from April 2010 to June 2010. The hospital projects it will save \$167,000 a year in the treatment and removal of medical waste<sup>53</sup>.

Disposal occurs off-site, at a location that is different from the site of generation. Treatment may occur on-site or off-site. On-site treatment of large quantities of biomedical waste usually requires the use of relatively expensive equipment, and is generally only cost effective for very large hospitals and major universities who have the space, labor and budget to operate such equipment. Off-site treatment and disposal involves hiring of a biomedical waste disposal service (also called a truck service) whose employees are trained to collect and haul away biomedical waste in special containers (usually cardboard boxes, or reusable plastic bins) for treatment at a facility designed to handle biomedical waste<sup>54</sup>.

---

<sup>52</sup> J. Michael Miller *et. al.*, “Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories Recommendations of a CDC-convened, Bio-safety Blue Ribbon Panel” *Morbidity and Mortality Weekly Report* pg. 61 (Jan. 6, 2012).

<sup>53</sup> Nydia Negron, “Lincoln Hospital pioneers innovative eco-friendly and cost-effective system to safely dispose of medical waste”, Lincoln, New York City Health and Hospitals Corporation, (Dec. 10, 2010).

<sup>54</sup> *Ibid.*

## 8.2 United Kingdom (UK)

In the UK, the primary aim in the management of waste, like any other country, is to ensure that it is handled, treated and disposed of safely, cost effectively and in a manner that does not impact negatively on the environment. The management of healthcare waste, previously known as clinical waste is an essential part of ensuring that healthcare activities do not pose a risk or have potential risk of infection and are securely managed. England and Wales, Scotland and Northern Ireland have their own sets of laws and regulations which differ from each other. The name of the regulatory instrument is often the same (or similar), although the date when it came into force may vary<sup>55</sup>. According to the Department of Health guidance, the Safe Management of Healthcare Waste<sup>56</sup>, healthcare waste are “any waste produced by, and as a consequence of, healthcare activities” and also covers offensive/hygiene and infectious waste produced in the community from non-NHS (National Health Service).

### 8.5.1 The Regulatory Framework

The Controlled Waste Regulations 1992 (issued under the Environmental Protection Act and in Northern Ireland by the Waste and Contaminated Land (Northern Ireland) Order has defined ‘clinical waste’ as:

- (a) “. . . any waste which consists wholly or partly of human or animal tissue, blood or other bodily fluids, excretions, drugs or other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous to any person coming into contact with it; and
- (b) Any other waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar practice, investigation, treatment, care, teaching

---

<sup>55</sup>Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg.8 (2013), *Available at:* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/167976/HTM\\_07-01\\_Final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf) (Last visited on Jan. 7, 2017).

<sup>56</sup>Government of United Kingdom, Safe Management of Healthcare Waste, Department of Health (2006), *Available at:* <http://www.nhsemployers.org/~media/Employers/Publications/Safe%20management%20of%20health%20care%20waste.pdf> (Last visited on Jan. 10, 2017).

or research, or the collection of blood for transfusion, being waste which may cause infection to any person coming into contact with it.”

The definition is wide enough for all practical purposes as it covers along with the clinical waste, activities such as ear piercing, tattooing, and practice of alternative medicines, funeral undertaking as well as animal care. Clinical waste can now be dealt with in a number of different ways under the provision of the Regulations. Clinical waste from a private dwelling or residential home is household waste and as such a local collection authority has a duty to collect it if requested to do so<sup>57</sup>.

In UK, clinical waste is broadly classified as “infectious” (identified as a new hazards group H9<sup>58</sup>) in the Hazardous Wastes Regulations and “medical waste” in order to concentrate on proper handling and disposal of such wastes. The waste legislations enacted for the purpose of controlling the unscientific handling, collection and disposal of clinical waste is very extensive. The Regulations apply to any person or organisation that produces clinical waste. The Regulation contained provision to make the producer responsible for want of care of clinical waste. The producer is also to ensure that all the regulations relating to waste disposal are properly and effectively followed and for the same detail, accurate description of the waste need to be maintained which would help in the safe handling, treatment and disposal of such waste.

Following the implementation of the Hazardous Waste (England and Wales) Regulations 2005, certain types of waste, previously defined as clinical waste Groups A to E are now defined as hazardous waste. Some is hazardous due to its hazardous properties, such as Cytotoxic and Cytostatic Drugs, and some is classified as hazardous according to its potential infection risk and where it was produced<sup>59</sup>.

The term “hazardous waste” used in England, Wales and Northern Ireland to describe waste with hazardous characteristics in the line with the List of Waste

---

<sup>57</sup> R. G. Kensett, *The Changing Scene of Health Care and Technology* pg. 317 (Taylor & Francis e-library, London, 1<sup>st</sup> Edn. 1990).

<sup>58</sup> Katherine Angel, “The Precautions of Clinical Waste: Disposable Medical Sharps in the United Kingdom” Vol. 4 Bio Societies, The University of Warwick pg. 190 (2009).,

<sup>59</sup> Safe Management of Healthcare Waste, A Guide to Good Practice in Secondary Care (England and Wales) January 2008, PHS Waste Management, *Available at:* <http://www.phswastemanagement.co.uk/Files/Healthcare%20Guidance.pdf> (Last visited on Feb. 21,2017).

Regulations, which transpose the European Waste Catalogue (EWC) into domestic legislation and provide codes for all hazardous and non-hazardous wastes. In Scotland it is termed as “special waste” in line with the Special Waste Amendment (Scotland) Regulations which implement the requirement of the Hazardous Waste Directive in Scotland<sup>60</sup>. It has been identified as new hazardous property “H13 Sensitising”, renumbered as H15 and defined it as “substances and preparations which, if they are inhaled or if they penetrate the skin, are capable of eliciting a reaction of hypersensitisation such that on further exposure to the substance or preparation, characteristic adverse effects are produced”<sup>61</sup>.

Taking into account the various definitions relating to the healthcare waste it is important to have a detailed idea regarding various laws and regulations to deal with the subject for its proper and effective management. There are a number of pieces of legislation that cover a wide range of issues, from the generation to the collection, transport and finally either treatment or disposal of healthcare waste. Some of the important Acts and Regulations are referred below.

- The Environmental Protection Act<sup>62</sup>,
- The Waste Management Licensing Regulations<sup>63</sup>,
- The Pollution Prevention and Control (England and Wales) Regulations<sup>64</sup>,
- Landfill Regulations<sup>65</sup>
- Hazardous Waste Regulations<sup>66</sup>,
- The Hazardous Waste Directives<sup>67</sup>

---

<sup>60</sup>Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 8 (2013), *Available at:* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/167976/HTM\\_07-01\\_Final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf) (Last visited on Jan. 7, 2017).

<sup>61</sup> *Ibid* at pg. 9.

<sup>62</sup>The Environment Protection Act, 1990.

<sup>63</sup>Waste Management Licensing Regulations, 1994.

<sup>64</sup> Pollution Prevention and Control (England and Wales) Regulations 2000.

<sup>65</sup> Landfill (England and Wales) (Amendment) Regulations 2005.

<sup>66</sup> Hazardous Waste (England and Wales) Regulations 2006, The Hazardous Waste Regulations and The Hazardous Waste (Northern Ireland) Regulations 2005 replaced The Special Waste Regulations in England, Wales and Northern Ireland.

<sup>67</sup> The Hazardous Waste Directive, 2011.

- Special Waste Amendment (Scotland) Regulations<sup>68</sup>
- Controlled Waste Regulations<sup>69</sup>
- Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (the Carriage Regulations)<sup>70</sup>
- Control of Substances Hazardous to Health (COSHH) Regulations<sup>71</sup> provides for the legislative framework for waste management activities. These regulations specify, through waste management licensing and related exemptions and pollution prevention control permits, how waste should be managed and specific conditions that sites must adhere to.

The above mentioned Rules and Regulations can be better understood by dividing it under the three tier legislations for its effective management to deal with specific health hazardous.

1. Infection control and health and safety legislation,
2. Environment and waste legislation and
3. Transport legislation.

### **8.5.1.1 The Environment Protection Act, 1990**

The main legislation governing clinical waste disposal is the Environmental Protection Act 1990. The Environmental Protection Act deals with issues relating to waste on land, defining all aspects of waste management and places a duty on local authorities to collect waste. The Act has spread over 9 parts including 16 schedules.

#### **8.5.1.1.1 The Duty of Care**

Part II sets out the main aspect of duty of care which is to be read with Part I for authorisations. A key element to the duty of care is the requirement for producers

---

<sup>68</sup> Special Waste Amendment (Scotland) Regulations 2004.

<sup>69</sup> Controlled Waste (Duty of Care) (Amendment) Regulations (Northern Ireland) 2004, The Controlled Waste Regulations, 2012.

<sup>70</sup> Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004.

<sup>71</sup> Control of Substances Hazardous to Health (COSHH) Regulations, 2002.

to ensure that a written description, adequately describing the type and quantity of waste, is provided for transfer of the waste as it is moved from point of production to point of final disposal. The Act states that all producers of waste have a duty of care to ensure the correct and proper management of waste is performed and states that it is “unlawful to deposit, recover or dispose of controlled clinical waste without a waste management licence, or in a way that causes pollution of the environment or harm to human health”<sup>72</sup>. The duty requires such persons to ensure that there is no unauthorised or harmful deposit, treatment or disposal of the waste, to prevent the escape of the waste from their control or that of any other person, and on the transfer of the waste to ensure that the transfer is only to an authorised person or to a person for authorised transport purposes and that a written description of the waste is also transferred. Some other statutory requirements covering duty of care in waste management are contained in:

- Section 5 of the Waste and Contaminated Land (Northern Ireland) Order,
- The Environmental Protection (Duty of Care) Regulations (England, Scotland and Wales), and
- The Controlled Waste (Duty of Care) Regulations (Northern Ireland).

Local authorities have specific duties in relation to healthcare waste. Section 45 of the Environmental Protection Act (in Northern Ireland, Article 20 of the Waste and Contaminated Land Order) states that it is the duty of each waste collection authority to arrange for the collection of household waste in its area<sup>73</sup>.

The “Duty of Care” includes the following

- To prevent the illegal deposit, disposal or treatment of any waste that you have produced.
- To prevent waste from escaping from control (leaking, blowing away, being stolen etc).

---

<sup>72</sup> Section 34(1) of the Environment Protection Act, 1990.

<sup>73</sup> Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 8 (2013), *Available at:* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/167976/HTM\\_07-01\\_Final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf) (Last visited on Jan. 17, 2017).

- To ensure that transfer of waste should be to the authorised persons.
- To ensure that any waste, transfer to another person, is accompanied by a written description. This description must be sufficient to allow others to appreciate the nature of the waste so that they can avoid committing an offence when they are managing it.

Apart from the above requirements the Duty of Care Regulations, 1991 introduced under Section 34(5) of the Environmental Protection Act, 1990 provides for the retention of the documents and also furnishing of the documents or copies of documents. Under Section 34(6) any person who fails to comply with the duty imposed by subsection (1) of Section 34 or with any requirement imposed under subsection (5) above shall be liable on summary conviction, to a fine not exceeding the statutory maximum; and on conviction on indictment, to a fine. The Waste (England and Wales) Regulations 2011 & Duty of Care (General) the Waste (England and Wales) Regulations 2011 have recently introduced a number of important changes to waste legislation, including for the first time a legal requirement to apply the waste hierarchy. They have also amended the requirements as to what must be included in Waste Transfer Notes and Hazardous Waste Consignment Notes in England and Wales<sup>74</sup>.

The Waste (England and Wales) (Amendment) Regulations 2012 were laid before Parliament and the Welsh Assembly on 19 July 2012 and came into force on 1 October 2012. The amended regulations relate to the separate collection of waste. They amend the Waste (England and Wales) Regulations 2011 by replacing regulation 13<sup>75</sup>. From 1st January 2015, waste collection authorities must collect

---

<sup>74</sup>“Legislation Overview: Guiding you through your legal responsibilities”, Initial, *Available at*: <http://www.initial.co.uk/waste-legislation/initial-medical-waste-legislation-overview.pdf> (Last visited on Jan. 13, 2017).

<sup>75</sup>Regulation 13 of the Waste (England and Wales) Regulations 2011 - Duties in relation to collection of waste—(1) An establishment or undertaking which collects waste paper, metal, plastic or glass must, from 1st January 2015, take all such measures to ensure separate collection of that waste as are available to the establishment or undertaking in that capacity and are—  
 (a) technically, environmentally and economically practicable; and  
 (b) appropriate to meet the necessary quality standards for the relevant recycling sectors.  
 (2) For the avoidance of doubt, co-mingled collection (being the collection together with each other but separately from other waste of waste streams intended for recycling with a view to subsequent separation by type and nature) is a form of separate collection.  
 (3) Every waste collection authority must, when making arrangements for the collection of waste paper, metal, plastic or glass, ensure that those arrangements are by way of separate collection.

waste paper, metal, plastic and glass separately. It also imposes a duty on waste collection authorities, from that date, when making arrangements for the collection of such waste, to ensure that those arrangements are by way of separate collection<sup>76</sup>. These duties apply where separate collection is necessary to ensure that waste undergoes recovery operations in accordance with the directive and to facilitate or improve recovery; and where it is technically, environmentally and economically practicable. The duties apply to waste classified as waste from households and waste that is classified as commercial or industrial waste. The amended regulations also replaced regulation 14(2) to reflect the changes to regulation 13 to ensure a consistent approach. Consequential changes are also made to reflect changes in paragraph numbering in the new regulation 13<sup>77</sup>.

Under the Carriage Regulations also duties have been imposed on parties at all stages of the supply chain, including manufacturers, consignors, carriers and receivers. The Carriage Regulations may require healthcare organisations to appoint or contract a Dangerous Goods Safety Adviser (DGSA). The requirement regarding DGSAs is a duty on the employer and is in large part dependent on the type/quantity of dangerous goods transported<sup>78</sup>.

### **8.5.2 Hazardous Waste (England, Wales and Northern Ireland) Regulations, 2006 and Special Waste (Scotland) Regulations, 2006.**

The Hazardous Waste Regulations and the List of Wastes Regulations define and regulate the segregation and movement of hazardous waste from the point of production to the final point of disposal or recovery (similar regulations apply in Northern Ireland). In England and Wales, the Hazardous Waste Regulations require that most premises producing hazardous waste be registered with the Environment Agency (EA). Premises are exempt from the requirement to register if they produce

---

<sup>76</sup>“Environmental Management Guidance: Waste Legislation and Regulations,” *Available at:* <https://www.gov.uk/guidance/waste-legislation-and-regulations> (Last visited on Jan. 13, 2017).

<sup>77</sup> *Ibid.*

<sup>78</sup> Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 17 (2013), *Available at:* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/167976/HTM\\_07-01\\_Final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf) (Last visited on Jan. 20, 2017).

less than 500 kg of hazardous waste in any period of 12 months<sup>79</sup>. In this connection it should be mentioned that for the transportation of the waste consignment notes are required. They are available from the respective environmental regulators (EA, Scottish Environment Protection Agency (SEPA) or Northern Ireland Environment Agency (NIEA). They may also be supplied by the waste contractor. The producer is legally responsible for ensuring the accuracy of a consignment note and in some instances it may be appropriate to seek advice from the waste contractor.

In Northern Ireland and Scotland, producers (or consignors) of hazardous waste are not required to register with the regulatory authority (NIEA and SEPA, respectively). Instead, they are required to provide 72 hours' prior notification to the relevant regulator of their intention to move hazardous/ special waste. The Regulations do not provide comprehensive guidance on the classification of waste. The EA, SEPA and NIEA produced a joint guidance document on the interpretation, definition and classification of hazardous waste entitled 'WM2'. This document is based on supporting European Directives and test methods<sup>80</sup>.

### **8.5.3 Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004**

The carriage of dangerous goods is subject to regulatory control under the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (known as the Carriage Regulations), and these apply throughout the UK. The Carriage Regulations are intended to reduce, to reasonable levels, the risk of harm or damage to people, property and the environment posed by the carriage of dangerous goods. The Carriage Regulations do not specifically regulate waste materials. They apply to all dangerous goods regardless of whether a substance is waste or not. Goods are assessed on their hazardous characteristics and, if applicable, are classified into one of nine classes of dangerous goods<sup>81</sup>.

---

<sup>79</sup>“Developing an European Union Standardised Approach to Vocational Qualification in the Healthcare Waste,” Assessment and National Report of the UK Healthcare Sector, European Healthcare Waste Management , pg. 12, Available at:

<http://hcwm.eu/media/deliverables/Country%20Reports%20Healthcare%20System%20Overviews/3.2%20HCWM%20System%20Overview%20UK.pdf> (Last visited on Jan. 21, 2017).

<sup>80</sup> *Ibid.*

<sup>81</sup> *Ibid* at pg.17.

The regulations cover among other things: training of personnel involved in the chain of distribution, substance classification and identification, packaging, marking, labelling and documentation, safety advisor, equipment and emergency procedures, safe loading, vehicle specification and operation.

#### **8.5.4 Landfill (England and Wales) (Amendment) Regulations 2005**

These Regulations set out a pollution control regime for landfills for the purpose of implementing the European Directive 99/31/EC on the landfill of waste known as “the Landfill Directive” in England and Wales. Part II deals with conditions to be included in landfill permits. Regulation 7 requires the Environment Agency to classify landfills as for hazardous waste, non-hazardous waste or inert waste. Regulation 8 sets out the requirements for conditions to be incorporated in landfill permits. These include conditions for ensuring compliance by landfill operators with the relevant requirements of these Regulations which are set out in remaining regulations in this Part and Schedules 1 (waste acceptance criteria), 2 (general requirements) and 3 (monitoring procedures). Regulation 16 provides for closure notices which may be used by the Environment Agency to initiate closure of landfills. Regulation 17 creates offences where waste is accepted contrary to the requirements which apply directly to landfill operators under paragraph 3 of Schedule 4.

#### **8.5.5 National Evidence-Based Guidelines**

National evidence-based guidelines for preventing Health-Care Associated Infection (HCAI) in National Health Service (NHS) hospitals were first published in January 2001 and updated in 2007. It was updated for the second time in the year 2012 and for publication in the year 2013. These guidelines provides for the adoption of the clinically effective measures to be followed by the healthcare workers for preventing infections in hospital and other acute healthcare settings. These guidelines can be appropriately adapted and used by all hospital practitioners. During the past two decades, HCAI have become a significant threat to patient safety. The technological advances made in the treatment of many diseases and disorders are often undermined by the transmission of infections within healthcare settings, particularly those caused by antimicrobial-resistant strains of disease-causing

microorganisms that are now endemic in many healthcare environments. It is said that many, although not all, HCAI can be prevented<sup>82</sup>.

### 8.5.6 Health Technical Memorandum

Apart from the above said laws and regulations the Health Technical Memorandum covers a range of waste streams produced directly from healthcare activities which provides practical advice for all those involved in the management of healthcare waste, and is applicable to all who come into contact with or manage healthcare waste (waste producers, waste contractors and regulators), providing a basis of common understanding for all parties including the public, all staff and third parties.<sup>83</sup>

In the UK, infectious waste, including healthcare waste/clinical waste, from any source, is prohibited from being sent to landfill unless it has undergone a process of pre-treatment commonly referred to as “rendered safe”<sup>84</sup>. The requirements of rendering safe depend on the type of waste treated and on the nature of the contaminants present in the waste. Once rendered safe, clinical waste should no longer pose a risk of infection, and, depending on the waste type, be unusable and/or unrecognisable.

England and Wales, Scotland and Northern Ireland have their own sets of laws and regulations which differ from each other. The name of the regulatory instrument is often the same although the date when it came into force may vary. In 2012-13, NHS Scotland produced 17,996 tons of clinical waste costing approximately £7.56 million in disposal costs. Healthcare facilities can realistically aim to decrease clinical

---

<sup>82</sup>H.P. Lovedaya, *et. al.*, “National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England” *Journal of Hospital Infection* pg. S11 (2014).

<sup>83</sup> Government of United Kingdom, “Safe Management of Healthcare Waste” Environment and Sustainability, Health Technical Memorandum pg. 1 (2013), *Available at*: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/167976/HTM\\_07-01\\_Final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf) (Last visited on Jan. 22, 2017).

<sup>84</sup> The Department of Health guidance document “Safe management of healthcare waste (SMHW)” defines rendering safe as “an accepted method or process which when applied: 1. demonstrates the ability to reduce the number of infectious organisms present in the waste to a level at which no additional precautions are needed to protect workers or the public against infection from the waste; 2. destroys anatomical waste such that it is no longer generally recognisable; 3. renders all clinical waste (including any equipment and sharps) unusable and unrecognisable as clinical waste; 4. destroys the component chemicals of chemical or medicinal and medicinally contaminated waste. (For laboratory autoclaves, see the “Research and laboratory facilities” sector guide.

waste by at least 15% through improved segregation practices. NHS Scotland organisations could make minimum savings of £800,000 by ensuring only clinical waste is disposed of via the clinical waste stream<sup>85</sup>.

One effective method to be adopted is by way of removing clinical waste bins from ward areas. When a clinician visits the patient, they collect their gloves, aprons and the clinical waste bag. All clinical waste produced at the bedside is placed in the bag and then the bag is tied and taken directly to the dirty sluice area. This removes all clinical waste immediately from the ward area, reducing the chance of infections spreading. During the trial of the two areas, it was found that the orange bag waste was reduced by 50%, hygiene waste by 30%, and black bag increased by 100%. This system has now been implemented in most areas in the hospital<sup>86</sup>.

## **8.6 Healthcare Waste Management in the City of London: Current Scenario**

The City of London, also known as the “Square Mile”, covering little more than one square mile, is the financial and commercial centre of London, and has a daily working population of approximately 380,000<sup>87</sup>. With a relatively small resident population of approximately 9,000, the City is primarily a business district and a visitor destination, receiving approximately 8.8 million visitors annually. The municipal waste arising in the city is 3,800 tons<sup>88</sup> arising from local authority collected municipal waste. The total amount of hazardous waste produced within the City of London in 2011 was 945.05 tons. 33% of the total tonnage produced (312.69 tons) infectious healthcare waste<sup>89</sup>. The Waste Data Interrogator records shows that the hazardous waste (including the clinical waste) deposited from City of London and received by other Waste Planning Authorities over the period 2010-2014 was 174,700 tons (total waste is over 1,523,400 tons). Hazardous waste only makes up 12% of the overall total of waste in this period. In 2014, according to Waste Date Interrogator

---

<sup>85</sup> Jessica Twemlow, “Waste Prevention and Re-use Guide”, National Health Service, Scotland, Scottish Government, pg. 16, *Available at:*

<http://www.resourceefficientscotland.com/sites/default/files/NHSScotland%20Waste%20Prevention%20and%20Re-use%20Guide.pdf> (Last visited on Jan. 21, 2017).

<sup>86</sup> *Ibid* at pg. 18.

<sup>87</sup> Maria Vinogradova, “Present and Future Waste Arisings”, Report for City of London Corporation, 2013 Review for the City of London 2013 pg.1 (Oct. 24, 2013).

<sup>88</sup> *Ibid*.

<sup>89</sup> *Ibid* at pg. 42.

1,088 tons of human and animal health care wastes were generated<sup>90</sup>. St. Bartholomew's Hospital (Bart's) is a major producer of hazardous waste in the City of London. Bart's is a 290 bed facility with 2,200 members of staff. It is Cardiac and Cancer Centre of Excellence. Around 90% of the total waste produced at the hospital is healthcare waste<sup>91</sup>. Most of the hazardous waste is being treated either in other London Boroughs or the South East of England e.g. Star Works Treatment Plant in Wokingham receives the waste from Bart's Hospital.

A study from twenty-six hospitals in London providing almost 7000 beds revealed that sixteen acute hospitals provided general medical, surgical, maternity, paediatric and a range of specialist services. The remainders were smaller community hospitals providing limited general medical, maternity and pediatric services<sup>92</sup>. All twenty six hospitals used wheeled and lidded carts for the storage of clinical waste. Four hospitals had additional smaller capacity carts in use, although these numbered less than twenty in total. There was approximately one clinical waste cart for every ten beds, with little variation between acute and community hospitals. All hospitals had a central cart storage area, with additional satellite storage areas in all acute hospitals. Satellite cart stores were sited both outside and inside hospital buildings, often close to stairwells or lifts, in corridors or on external walkways<sup>93</sup>. An audit of the standards of clinical waste management in hospitals in London and the south-east of England revealed many shortcomings. It has seen that bulk clinical waste carts were left in corridors and walkways, obstructing stairways and fire exit routes. Basic security arrangements were inadequate or non-existent, with clinical wastes in unlocked carts left in areas freely accessible to the general public despite, in some cases, the availability of secure waste compounds that were not used<sup>94</sup>.

It was observed that few clinical waste carts were locked; in twenty one of twenty six hospitals, the total absence of locked clinical waste carts suggests that failure to properly secure hazardous waste was a common, regular practice. The

---

<sup>90</sup>Department of Built Environment, "Waste Arising and Waste Management Capacity Study Review 2016" City of London Corporation, pg. 35 (2016).

<sup>91</sup>*Ibid* at pg. 47.

<sup>92</sup>J.I. Blenkharn, "Standards of Clinical Waste Management in UK Hospitals Vol. 62 Journal of Hospital Infection pg. 301 (2006).

<sup>93</sup>*Ibid* at pgs. 301-302.

<sup>94</sup>J. I. Blenkharn, "Standards of Clinical Waste Management in Hospitals-A Second Look" Vol. 121 Journal of the Royal Institute of Public Health pg. 541 (2007).

location of storage areas for filled waste carts was inadequate in most cases, with carts freely accessible to the public. Furthermore, the location of waste carts in satellite locations may contravene fire regulations by creating an unacceptable obstruction. Overfilled carts with lids that are not and cannot be closed properly create a further fire risk, and increase the probability of waste spillage<sup>95</sup>.

The storage, transport, transfer, treatment and disposal of clinical waste are continuing to pose major problems particularly in the London area. The London Waste Regulation Authority recognising this established a Member Level Working Party to examine them. They set up an enquiry so that professional staff of the various interested organisation could identify in detail the problems<sup>96</sup>.

A Compendium on good practice of health care waste minimisation published during 2000 and amended in 2013 provides an analysis of current waste management systems in operation within Hospital Trusts including London laying detailed case studies of good waste minimisation practice for improvement in waste elimination, re-use and recycling initiatives, sharing information, education and influencing of staff and partnership arrangements. The survey in different hospitals in England and Wales showed seventy per cent of respondents currently operate a policy to ensure operational systems to manage waste disposal also cover clinical waste<sup>97</sup>. The Trusts are increasingly segregating clinical and domestic waste to reduce costs. Successful programmes adopt a team approach, including support from infection control backed up by staff training and the findings were that most of the trusts showed examples of good waste management practices focusing on clinical waste management and organisational costs. In the University College London Hospitals and the Middlesex Hospitals it has been seen the reduction in clinical waste from sixty to forty five tons per year resulting in the cost savings of forty thousand pound and increasing number of recycling of the waste has been made effectively.

---

<sup>95</sup> J.I. Blenkharn, "Standards of Clinical Waste Management in UK Hospitals Vol. 62 Journal of Hospital Infection pg. 303 (2006).

<sup>96</sup> R. G. Kensett, *The Changing Scene of Health Care and Technology* pg. 317 (Taylor & Francis e-library, London, 1<sup>st</sup> Edn. 1990).

<sup>97</sup> Government of United Kingdom, "Healthcare Waste Minimisation: A Compendium of Good Practice" England and Wales, Department of Health, pg. 4 (2000).

## 8.7 People's Republic of China

There were 3,351 thousands of beds in health institutions in 2005. In that year, the utilization rate of beds was 62.9%.<sup>98</sup> According to a study on safe management of wastes from healthcare activities prepared by the World Health Organization (WHO), the daily waste generation per bed calculated for China is approximately 1.8 to 2.2kg, in which about 80% waste is comparable to non-risk general domestic waste and about 20% (or 0.36 to 0.44kg) is Medical Waste (MW) requiring special regulation. The survey made during the project preparatory phase indicated that the MW generated per bed per day in China is 0.37 kg in 2005, very close to the result reported by the WHO<sup>99</sup> and according to a latest data (2011) published by the Ministry of Health department of China, the net amount of MW produced was approximately 1.882 million tons in 2012 with a daily average output of 1kg/bed<sup>100</sup>.

As a country with a large of population of more than 1.2 billion, China produces a huge quantity of MW. In 2002, China produced 650,000 tons per year of MW or 1,780 tons a day. With the increase in population and medical institutions and the improvement of medical conditions, the quantity of MW takes the trend to increase year by year. It is estimated that the annual generation of MW in China will be up to 680,000 tons by 2010<sup>101</sup>. The table<sup>102</sup> published by the government of China namely National Health Statistics Yearbook 2009-2011 shows the increasing nature of MW.

---

<sup>98</sup>Li Li, "The Status and Trend of Development of Healthcare Waste in China" Chinese Research Academy of Environment Science, Beijing, pg. 4 (2015).

<sup>99</sup> United Nations Industrial Development Organisation, Environmentally Sustainable Management of Medical Waste - UNIDO project Project of the People's Republic of China, pg.18 (July, 2011).

<sup>100</sup> Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb.3, 2017).

<sup>101</sup>United Nations Industrial Development Organisation, Environmentally Sustainable Management of Medical Waste - UNIDO project Project of the People's Republic of China, pg.18 (July, 2011) Available at:

[https://www.unido.org/fileadmin/user\\_media/About\\_UNIDO/Evaluation/Project\\_reports/Evaluation%20report%20Medwaste%20Final%20-%202011%20Aug%202011.pdf](https://www.unido.org/fileadmin/user_media/About_UNIDO/Evaluation/Project_reports/Evaluation%20report%20Medwaste%20Final%20-%202011%20Aug%202011.pdf) (Last visited on Feb. 5, 2017).

<sup>102</sup> Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb. 6, 2017).

**Table 2****Amount of Medical Waste (MW) from 2008-2012**

<b>Year</b>	<b>Total number of Beds (10,000)</b>	<b>Bed occupancy rate (%)</b>	<b>Medical Waste (MW) (kg/bed/day)</b>	<b>Total MW/year (10,000)</b>
2008	403.87	81.5	1	120.14
2009	441.66	84.7	1	136.54
2010	478.68	86.7	1	151.48
2011	515.5	88.5	1	166.52
2012	572.5	90.1	1	188.28

Studies showed that MW management process is still not being well implemented. From 2007 to 2010, there were 44890 accumulated cases in violation of ‘the regulations on the Health-Care Waste (HCW) management’ with an increase of 19.56% from cumulative total of 9745 in 2007 to 11,650 in 2010<sup>103</sup> despite having strict laws relating to the subject.

**8.7.1 Acts, Regulations, Rules and Standards**

China initiated MW management legislation much later than the developed countries such as America and Japan. In China, the medical agency varies from village clinic, town hospital, and county hospital to municipal hospital, provincial hospital, industry hospital and military hospital. Since 2003, a series of laws, regulations, or standards relating to medical waste management and disposal were formulated. Before 2003, medical waste disposal was based on the principle of “who produce, who were harmless”, regardless of the size of the hospital medical waste incinerators should be set<sup>104</sup>. In 2003 year, the outbreak of “SARS”<sup>105</sup> epidemic gave rise to the urgent need to strengthen the medical waste disposal and management. In 2003-2007 years, a series of regulations, standards, norms, regulations have been

---

<sup>103</sup> *Ibid.*

<sup>104</sup> Z.B. Bao, *et. al.*, “The Development Status of Medical Waste Category, Management and Disposal in China”, cited in Yeping Wang & Jianhua Zhao, *Advances in Energy, Environment and Materials Science* pg. 213 (CRC Press, 2016).

<sup>105</sup> Severe Acute Respiratory Syndrome.

formulated<sup>106</sup>. Prior to 2003, the laws, regulations or standards associated with medical waste were:

- Environmental Protection Law of China, 1989.
- Law of China on the Prevention and Control of Infectious Diseases, 1989.
- Law of the People's Republic of China on the Prevention and Control of Environment Pollution by Solid Wastes, 1995.
- Graphics Signs for Environmental Protection Solid Waste Storage (Disposal) Site, 1995.
- National List of Hazardous Wastes, 1998.
- Pollution Control Standard for Hazardous Waste Incineration 2001.
- Standard for Pollution Control on Hazardous Waste Storage, 2001.
- Standard for Pollution Control on Hazardous Waste Landfill 2001.

From 2003 to 2006, considering the dangerous affect of medical waste various other laws, regulations or standards were enacted, those are:

- **Regulation on Medical Waste Management, 2003**, the first laws about the MW management regulations which marked standardisation and legalisation of MW from generation, storage, transportation and centralised disposal, to strengthen safety management of medical waste, prevent the spread of disease and protect the environment.
- **Technical Standard for Medical Waste Transport Vehicle, 2003** to provide provisions for the special requirement of medical waste transport vehicles, stipulate that the finalized thermal insulation and refrigerated truck transport of medical waste.
- **Technical Standard for Medical Waste Incinerator, 2003** for the prevention and treatment of medical waste incinerator pollution to environment, regulate incinerator design, manufacture, performance and safety use.

---

<sup>106</sup> Z.B. Bao, et. al., "The Development Status of Medical Waste Category, Management and Disposal in China," cited in Yeping Wang & Jianhua Zhao, *Advances in Energy, Environment and Materials Science*, pg. 214 (CRC Press, 2016).

- **The Classification Catalogue of Medical Waste, 2003** standardise the classification and characteristics of medical waste, identify their common components or specific name.
- **Measures for Medical Wastes Management of Medical and Health Institutions, 2003**, provided provisions for medical waste management of medical and health institutions, effectively prevent and control hazards of medical waste on human health and the environment.
- **The Centralised Disposal Technical Specifications of Medical Waste (on Trial), 2003**, laid down the standard for technical requirements of medical waste temporary storage, transportation and disposal, the training and safety requirements of the relevant personnel, incidents prevention and response measures.
- **The Management Administrative Punishment Measures of Medical Waste, 2004**, clear the respective responsibilities of above the county level health administrative departments and environmental protection departments, provision for the administrative penalties of violating medical waste management regulations.
- **Technical Specification Medical Waste Centralized Incineration Facility, 2005** laid down provisions for the construction of medical waste incineration projects, prevent the pollution of medical waste incineration to the environment.
- **Technical Specification for Chemical Disinfection Centralised Treatment Engineering on Medical Waste (on Trial), 2006** provides provisions for the practical application medical waste chemical disinfection treatment technologies, guide the planning, design, construction, inspection and operational management of medical waste chemical disinfection treatment projects.
- **Technical Specifications for Microwave Disinfection Centralised Treatment Engineering on Medical Waste (on Trial), 2006**, provisions for the practical application of medical waste microwave sterilization treatment technology practice, guide the planning, design, construction, operation and management of medical waste microwave disinfection treatment project.

According to the Regulation on Medical Waste Management, 2003, medical waste refers to “directly or indirectly infectious, or poisonous, or otherwise harmful wastes generated by medical institutions in medical treatment, prevention, health care, and other relevant activities”. This regulation was significant in that it:

- Represented the first legal definition of medical waste in Chinese law;
- Provided clear guidelines for each stage of the treatment of medical waste;
- Mandated centralised treatment by authorized entities;
- Required waste generators to properly classify and manage medical wastes; and,
- Mandated that cities above the county level complete the construction of medical waste treatment facilities by 2004.

In the Category Catalogue of Healthcare Waste of China, healthcare waste was divided into 5 categories, which were infectious waste, pathological waste, sharps, pharmaceutical waste and chemical waste<sup>107</sup>.

Following the issuance of the Regulation on Control of Medical Waste, many other departments within the Chinese government such as the Ministry of Health (MOH) also issued relevant regulations and guidelines. In October 2003, the MOH and Ministry of Environmental Protection (MEP) published the Inventory of Medical Waste Classification, which classified medical wastes into five groups. During the same month, MOH promulgated the measures for Medical Wastes Management of Medical and Health Institutions<sup>108</sup>.

Thus, according to the needs and for the effective management and disposal, China has established laws and regulations, policies and standard. A number of medical waste disposal facilities have also established, so that the management and

---

<sup>107</sup> Li Li, “The Status and Trend of Development of Healthcare Waste in China” Chinese Research Academy of Environment Science, Beijing, pg.4 (2015).

<sup>108</sup> Mao Zhimin, “Waste Mismanagement: China’s Struggle with Medical Trash” China Environment Forum, (June, 2009).

disposal would be in accordance with the standard provided in the laws. Again in 2007 to 2014, China further developed a series of technological standards relating to disposal detail so that medical waste would possibly be disposed of as per such standard to ensure its safety and effectiveness. Such standards are:

- **The Technology Standard for Hazardous Waste (Including Medical Waste) Incineration Disposal Facilities Dioxin Emission Monitoring, 2007**, provisions for dioxin-like pollutants monitoring in exhaust, emission of hazardous waste incineration facilities and medical waste incineration facilities, reducing dioxin pollution to the environment.
- **Standard of Packaging Bags, Containers and Warning Symbols Specific to Medical Waste, 2008**, provisions for medical wastes bags, tool box and containers technical requirements, corresponding test methods and inspection rules and regulations for medical waste warning signs.
- **Perfectly Revised National List of Hazardous Wastes, 2008**, specifies medical waste belonging to hazardous waste.
- **Technical Specifications for the Supervision and Management to the Operation of Centralised Incineration Disposal Facilities for Hazardous Waste (on Trial)**, strengthen supervision and management of medical waste incineration facilities operation, to ensure that the standardized operation of medical waste incineration facility.
- **Technical Specification of Performance Testing for Facilities of Hazardous Waste (Including Medical Waste) Incineration, 2010**, provisions for test content, procedures and technical requirements of hazardous waste (including medical waste) incineration facilities involved in performance testing.
- **Technical Specifications for Collection, Storage, Transportation of Hazardous Waste, 2012**, provisions for technical requirements of hazardous waste collection, storage and transport.
- **Technical Specifications for Hospital Sewage Treatment, 2013**, provisions for Standard design, construction and operation management of hospital sewage treatment works to prevent hospital sewage to pollute the environment.

- **Technical Guidelines for Solid Waste Treatment & Disposition Engineering, 2013**, provides for general technical requirements for solid waste disposal engineering design, construction, inspection, operation and maintenance.
- **General Specifications of Engineering and Technology for Hazardous Waste Disposal, 2014**, specifies the technical requirement and regulations concerning the application of hazardous waste disposal technology and engineering design construction, inspection, operation and management process.

Therefore, with the social and economic development, new diseases, new drugs and medical devices are emerging; medical waste output growth accelerated and medical waste pollution accidents have become frequent. Despite various laws, regulations and standards there is great disparity of economic development and allocation of medical resources among and within the Eastern, Central and Western regions of China. This has caused significant regional differences in the type and quantity of Medical Waste. Due to lack of data and absence of relevant surveys and statistics, it is difficult to make a precise estimation on the quantities of MW being produced at present in China.

Pursuant to the Regulations on Medical Waste (MW) Management, most Medical Institutions have established a MW management system to deal with matters relating to hospital MW management. Duties of departments involved in the MW management are defined in the management system. For example, the Department of General Affairs and Logistics is responsible for the collection, transfer and temporary storage of health care wastes. Healthcare doctors and nurses classify MW and the department of infection control is responsible for supervision, inspection and feedback on the treatment of MW. Emergency response plans in case of leakage of healthcare have also been established.

There are several HCW disposal methods, such as incineration, steam sterilization, microwave sanitation, chemical disinfection, dry heat disinfection, and disinfection with superheated steam, solidification, recycling and land filling. Only incineration technology has been implemented in China. HCW incinerators need high

operation and maintenance costs and require ash disposal cost as well. But up to now China hasn't find better way to deal with the HCW for reducing pollution<sup>109</sup>. The National Plan for the Construction of Disposal Facilities for Hazardous Waste and Medical Waste undertaken in 2003 was an important steps towards the centralized disposal of such wastes. The purpose of this National Plan was to solve the problems such as lack of disposal ability of healthcare waste, the low technical level of disposal facilities and the serious secondary pollution. It was brought forward 300 centralized disposal facilities for healthcare waste would be constructed before 2007. The increased ability of disposal would be 2080 ton/day. The healthcare waste in China would be stored and disposed safely after the construction of those facilities<sup>110</sup>.

Although number of laws are in existence but review shows that the existing laws and regulations are too general, and there is a lack of detailed rules to support their implementation. The standards for the control of pollution from incineration are too low, and the standards for the control of pollution from non-incineration treatment are still missing<sup>111</sup>. In addition to this there is lack of commercially available options for diversified investment and professional operation in MW treatment and disposal facilities<sup>112</sup>.

## 8.8 Bio-medical Waste Scenario in Beijing, China

Beijing, the capital of China, is a huge metropolitan area with a population that reached 21.15 million in 2014. And like many other large and rapidly growing cities in China, it continues to face waste management issues as waste generation exceeds capacity<sup>113</sup>. Beijing has a major garbage problem. The city generates 18,000 tons of waste a day, 7,000 tons more than the capacity of disposal plants<sup>114</sup>. Medical

---

<sup>109</sup> Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.w.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb.16, 2017).

<sup>110</sup> Li Li, "The Status and Trend of Development of Healthcare Waste in China" Chinese Research Academy of Environment Science, Beijing, pgs. 9-10 (2015).

<sup>111</sup> *Ibid* at pg. 16.

<sup>112</sup> *Ibid* at pg. 26.

<sup>113</sup> Steven Cohen, *et. al.*, "Waste Management Practices in New York City, Hong Kong and Beijing" pg. 9 (Dec. 2015), Available at: <http://www.columbia.edu/~sc32/documents/ALEP%20Waste%20Management%20FINAL.pdf> (Last visited on Feb. 15, 2017).

<sup>114</sup> Gina Marie Cheeseman, "Beijing's Trash Problem Needs More Recycling, No Deodorant Guns," Triple Pundit, (Apr. 20, 2010).

waste, totaling 40 tons a day, poses a pressing problem after the outbreak of the SARS (severe acute respiratory syndrome) epidemic in the spring of 2003, which killed 193 people in Beijing<sup>115</sup>.

Among the four directly governed city regions, Beijing, Chongqing, Shanghai, and Tianjin, Tianjin achieved 100 percent collected treatment of medical waste since 2005 while Beijing and Shanghai lagged behind. However, Shanghai improved its collected treatment rate of medical waste from 31.6 percent in 2005 to 78.37 percent in 2007. Beijing also achieved significant improvement in terms of waste treatment during its preparation for the Olympic Games. During 2004 and 2005, two medical waste treatment facilities with daily treatment capacity at 60 tons were completed, well covering Beijing's medical waste generation rate of 41 tons/day<sup>116</sup>.

China has adopted new developmental technology to deal with the various problems including handling the medical waste problem. Using barcode technology to manage drugstore inventories and track down drugs, adopting Radio Frequency Identification (RFID) technology to prevent new-born babies from getting mixed up in hospitals, employing medical waste monitoring systems to manage medical waste, such new weapons are quietly changing the management of modern hospitals and are allowing hospital managers to get the most out of the information age<sup>117</sup>. Barcode technology can play an important role not only in medical waste management but in drug tracking and stock management, patient management and tracking, and consumables management. A major hospital in Hangzhou adopted barcode technology to manage its inspection department, while Beijing's Tiantan Hospital employed it to manage its valuable consumables. The hardware needed was just one Zebra printing device, while the backstage system uses the corresponding support from the hospital HIS<sup>118</sup>.

Further, in 2006, Beijing Friendship Hospital implemented a medical waste management information system that used the hospital's existing PC terminals and

---

<sup>115</sup> Garbage Treatment Gets a Facelift, *China Daily*, Feb. 13, 2004.

<sup>116</sup> Xinhua Zhang, A. Oladele, *et. al.*, Health Care Waste Management Policy Assessment in China, Available at: <http://www.w.allconfs.org/img1/2013117174854234.pdf> (Last visited on Feb.19, 2017).

<sup>117</sup> Wei Yusu, Information Technology quietly Changes the face of Hospitals, *Medicine Economic News*.

<sup>118</sup> *Ibid.*

barcode technology to identify all medical waste. All nursing stations are equipped with RFID devices to complete the transfer of waste between nurses and transportation staff. Medical waste transfer stations are equipped with PC terminals, electronic scales, barcode scanning guns, RFID devices and printers to complete the weighing and transfer of medical waste. To avoid cross contamination, non-contact identification technology is adopted. In addition, the system exchanges information with the death management system, the in-hospital contamination management system and the contagious disease management system<sup>119</sup>.

Although Beijing's first medical waste disposal facility began its operation early in 2004 in the capital city's suburban Daxing District in the Nangong Medical Waste Disposal Plant, which cost 10 million yuan (about US\$1.2 million) which had the capacity to dispose of 15 of the 41 tons of medical wastes the city produces each day<sup>120</sup>, instances of illegal disposal of such waste is still continuing. According to an undercover report published on 1<sup>st</sup> April, 2015 by the Beijing Times,<sup>121</sup> unprocessed chemical waste from a tank at the Shunyi District branch of the Beijing Ditan Hospital was dumped into a storm drain via a 30-meter-long pipe and such disposal continued for several days. It shows that despite having strict laws the situation continues to prevail although cases are numerous. Towards eradicating medical waste, China has adopted centralised medical waste disposal technologies which can be divided into two major categories of incineration and non-incineration. The adoption of medical waste high-temperature steam sterilisation technology as a non-incineration technology is currently applied more widely. Although it suffers from shortcomings, however, it produces no dust and dioxin which is also considered as cause of concern from such disposal technology. Moreover, due to small investment, low operation cost and flexible operation etc. it has been consider as an important and effective method of disposal technology to be followed by the countries of the world.

---

<sup>119</sup> *Ibid.*

<sup>120</sup>“Beijing's First Medical Waste Disposal Facility Begins Operation”, *Xinhua News Agency, Environment*, Dec. 30, 2004.

<sup>121</sup>“Illegal Medical Waste Dumping Story Sparks Probe”, *Sanghai Daily*, April 5, 2015.

In a bid to reduce pollution and protect public health, China has decided to impose harsh punishment on those who will fail to handle the medical waste properly. according to criminal law, those who severely pollute the environment can receive up to three years in prison, while those causing extreme damage can be sentenced to between three and seven years in prison plus a fine<sup>122</sup>. Companies or government units that illegally collect, store, transport, and handle medical waste will have their licences revoked and heavily fined, reported Xinhua citing a statement from the National Health and Family Planning Commission. The commission said it will strengthen the monitoring of medical waste disposal companies and units, and cooperate with environmental authorities to shut down substandard waste disposal facilities. It will transfer those involved in environment pollution crimes to police authorities. It also urged local authorities to establish a sound price system for medical waste procurement before the end of 2015 and improve their hazard-free disposal of medical waste<sup>123</sup>.

Recently, the police in Nanjing, Jiangsu province, arrested three suspects who allegedly traded thousands of tone of medical waste that was later processed into disposable tableware and fake brand-name toys<sup>124</sup>. It is to be noted that China only allows authorised companies specialising in medical waste to engage in such business and such steps is as part of the recycling of medical waste for the purpose of reusing the same.

## **8.9 Analysis of the Laws of USA, UK and China for Better Management of Bio-Medical Waste in India**

From the numerous laws, rules, regulations, guidelines etc. of USA, UK and China on Bio-Medical Waste, it is clear that respective countries have tried to enact comprehensive laws with a view to mitigate and to completely eradicate the problem relating to the subject. Although it cannot be concluded beyond doubt that these countries are successful in resolving the Bio-Medical Waste problem within the ambit

---

<sup>122</sup> Cang Wei, “Medical Waste turned into Tableware, Toys”, *China Daily*, Dec. 21, 2016.

<sup>123</sup> “China to Punish Harshly over Medical Waste Disposal”, *Daily News & Analysis*, Essel Group, Jan. 9, 2014.

<sup>124</sup> Cang Wei, “Medical Waste turned into Tableware, Toys”, *China Daily*, Dec. 21, 2016.

of such laws, still such laws are considered effective and the inclusion of the same in the Bio-Medical Waste related laws of India would help in tackling the problem. There is no denying the fact that despite having numerous laws of these countries, in practice the proper and effective management of the Bio-Medical Waste is not very satisfactory. Yet, it can be said that the steps undertaken by the developed countries would help the underdeveloped and developing countries to cope up with the menace relating to the subject by following their footsteps. An analysis of the various laws of these countries shows that the how new and advanced technology has helped them in reducing the menace of Bio-Medical Waste in a cost effective manner. However, the high cost of installation of the advance technology, the lack of positive attitude and awareness are putting hindrances on the way to the successful management of the same. Further, the existence of new pollutant necessitated the application of new technology which is required to be invented at first. The invention of the new technology and its manufacture is a time consuming issue and by the time the same is available in market the pollution increases to certain extent that the problem remains the same. However, within their respective capacity these countries are making all effort for the successful management of the Bio-Medical Waste and the outcome is the effective reduction in the quantity of the Bio-Medical Waste which in turn help in the reduction of the cost of Bio-Medical Waste management.

### **8.5 An Overview**

From the above analysis it can be concluded that although the developed countries like USA, UK and China are facing problem in the proper and effective management and disposal of the Bio-Medical Waste still the positive effort they have shown would obviously help them in eradicating the Bio-Medical Waste issue in the long run. In this background it can be easily imagine the existing scenario prevailing in the developing and the underdeveloped countries. Apart from the high cost of installation of the advance technology, the lack of positive attitude and awareness is hindering in the way for the successful management of the Bio-Medical Waste. Further, the existence of new pollutant gives rise to the immediate necessity of installation of new technology which is not possible due to the financial crunch. Moreover due to lack of proper training and education among the health care

personnel the existing Bio-Medical Waste scenario in the country remained unchanged. Instead of reducing the quantity of the Bio-Medical Waste the same is increasing in nature and despite having the Rules the situation is worsening.