

# LEGALFOXES LAW TIMES

## SUSTAINABILITY AND URBAN PLANNING

### A critical analysis of the Waste Management System in India

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## ABSTRACT

*This article focuses on the concepts of urban planning and sustainability with specific reference to India. In the concept of urban planning, the idea of smart city v/s sustainable city has been highlighted. Environmental degeneration is matter of growing concern not just amongst environmentalists, but also amongst the society. Over the recent years, there has been increased attention given by several members of the public to ensure that developmental policies of the government are in conformity with the principle of sustainable development and adhere to precautionary principle recognised by the Indian judiciary. Yet, one aspect in which India has always failed to achieve development is the system of waste management. A case study on the waste management problems in Mumbai particularly at and due to the Deonar Dumping Ground, one of the largest dumping grounds in the world, in light of the aforementioned concepts. The article identifies the social problem accruing out of the mismanagement of waste and traces the evolution of conventions relating to waste management and sustainability and the obligation it imposes of the signatory parties. It also focuses on India's stand with regard to the same. The various conventions like UNFCCC, London Protocol etc have been discussed by the researcher, highlighting the main aspects of these conventions, along with its implementation rate and failures. It also focuses on the need to combine the concepts of sustainability and development in such a way that it leads to decrease in pollution levels as well as decrease in rate of rise in temperature.*

*The data collected has been analysed in detail, highlighting the problematic aspects and appreciative the positive measure. The author has also noted a few recommendations, which when implemented can lead to a solution to Mumbai's environmental problems related to waste management, which can also be applied in other Indian cities.*

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**KEYWORDS:** International Conventions, Indian Laws, Waste Management System, Deonar Dumping Ground, Kyoto Protocol, Environment Protection Act, landfills.



**PART I: SUSTAINABILITY AND URBAN PLANNING****A. INTRODUCTION TO SUSTAINABILITY AND URBAN PLANNING**

In 1983, the United Nations ["UN"] along with the then Norwegian Prime Minister started the *World Commission on Environment and Development* to raise the standards of living through industrialisation. While this may have been useful in solving the problem of poverty to some extent, it had wide scale implications on ecological and social equity. It was then that the world realised that mere economic upliftment is not sufficient. It must be coupled with harmonization of ecology with prosperity in order to have long lasting prosperity. Thus, "*Our Common Future*" was released four years down the line which gave the first documented and infamous definition of sustainable development-

*"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*<sup>1</sup>

'Sustainability' was treated to be a comprehensive and holistic approach incorporating ecological, social and economic dimensions and balancing each of these for long lasting prosperity and development of the world. Over the years, the concept of sustainability has gained popularity, with many people now understanding its importance and significance and many policy makers across the globe emphasising the concept and basing their models on sustainability.<sup>2</sup>

Urban planning is associated with the study of the built environment of a city, town or other urban areas and is closely related to environmental studies, conservation and land-use planning, within the school of architecture.<sup>3</sup> Sustainable development integrated with the concept of urban planning aims to create beautiful, healthy and at the same time, eco-friendly cities to satisfy the needs of the citizens.<sup>4</sup> This will guarantee a better quality of life for the present and future generations and strike a balance between the city and natural

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<sup>1</sup> G. Brundtland, *Our Common Future: The world commission on environment and development*, Oxford University Press, Oxford, 1987.

<sup>2</sup> United Nations General Assembly, *Sustainable development: Managing and Protecting our Common Environment World Summit Outcome*, 2005, last accessed on 27 July 2019, <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N05/487/60/PDF/N0548760.pdf?OpenElement>.

<sup>3</sup> F. Stuary, Chapin, *Urban Land Use Planning*, 1957, p.77.

<sup>4</sup> A.N. Tetior, *Sustainable urban development*, Moscow, 1999.

environment.<sup>5</sup> This has even been envisaged at the international level by the UN-HABITAT human settlements centre,<sup>6</sup>Urban Environment Forum (UEF) and United Nations Environment Programme (UNEP) among others.

*“Cities are the abyss of the human species”*

-Jean-Jacques Rousseau

The realisation of the need for such initiatives and measures to be implemented came with the problem of depletion of core renewable resources and the emergence of multiple indicators of global crisis including overpopulation, depletion, deforestation and water pollution.<sup>7</sup> It is then that scientists and reformers decided that while there was a necessity to re-model cities in a more user and resident friendly manner, this is to be done in keeping with eco- friendly models and sustainable use of resources.<sup>8</sup>Construction and design are the forerunners in urban planning and hence, sustainability is required to be implemented from this. Hence, the concept of *“Green Buildings”* and *“Green Construction”*<sup>9</sup> emerged wherein through changes in the landscape, architecture, design etc, sustainable development was achieved while improving the quality of life.<sup>10</sup>Green infrastructure thus, consists of a network of multi-functional open spaces, parks, waterways, trees and woodlands which are needed to support a high quality of life in and around towns and cities.<sup>11</sup>

Creation of Sustainable Cities involve reducing the area of human induced land to turn a large part of developed and polluted territories into their natural state. In order to meet the shelter needs of the immense urban population, merely clearing the land is not sufficient.<sup>12</sup> What is also essential is the creation of bio positive facilities that will lead to achieving

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<sup>5</sup> Historic Districts for All: A Social and Human Approach for Sustainable Revitalization, UNESCO, WHO, CIGF and Space Group, 2008.

<sup>6</sup> UN-Habitat, The State of the World's Cities 2006/07: the Millenium Development Goals and Urban Sustainability, Earthscan Ltd., London, 2006.

<sup>7</sup> S. McDonald, N. Malys, V. Maliene, Urban Planning for Sustainable Communitites: A Case Study, Technological and Economic Development of Economy, Baltic Journal on Sustainability, 15 (2009), p. 49-59.

<sup>8</sup> H. Girardet, Creating Sustainable Cities, (Tilde, London, 1990.

<sup>9</sup> Yu.A. Tabunschikov, M.M. Brodach, N.V. Shilkin, Energy efficient buildings, AVOK-PRESS Publ., Moscow, 2003.

<sup>10</sup> C.J. Kibert, Sustainable Construction: Green Building Design and Delivery, third ed., John Wiley & Sons, New York, 2012.

<sup>11</sup> Stigsdotter, U.A., Urban Green Spaces: Promoting Health through City Planning, Swedish University of Agricultural Sciences, Uppsala, (2008), p. 17.

<sup>12</sup> B. Richard, Density and Urban Sprawl, Land Economics, 65 (1989), p. 193-204.

sustainability, rectifying the imbalance and preventing human induced destruction of nature.<sup>13</sup> Sanitation and hygiene are also supremely important in ensuring sustainable urban planning.<sup>14</sup> This involves ensuring favourable insulation and air conditions, prevention of noise pollution and so on.<sup>15</sup>

## **PART II: SUSTAINABILITY, URBAN PLANNING AND SMART CITY V/S SUSTAINABLE CITY**

### **A. HISTORY AND GENESIS OF THE CONCEPT OF SUSTAINABLE CITY**

Urbanisation, Modernisation and Industrialisation are major concepts which have dominated the minds of most policy-makers, governments, citizens and residents across the globe. In the 1990's, there was an emergence of scholarly literature and policy reports on '*sustainable cities*,' in the light of a response to the Rio Declaration, also known as Earth Summit. '*Sustainable City*' is a city that is taking into consideration the long-term consequences and is hence tackling its economic, social and environmental challenges in the vast areas of its concerns, including industrial, transport, health, education etc using renewable energy or eco-friendly methods.<sup>16</sup> They form the foundation for transforming societies into low carbon economy by parallelly increasing socio- economic benefits through the smarter use of available resources and technology. One of the most well-planned sustainable cities is considered to be a neighbourhood known as 'Vauban' in Freiburg, Germany, wherein the planning process is characterized by parks, public spaces, overall increase in living density and low car ownership.<sup>17</sup>

The techno-sphere posed as threat to the natural systems and processes, extracting fossil energy from geospheres, emitted waste of substances into the biosphere and reduced the

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<sup>13</sup> G.V. Esaulov, Sustainable architecture - from principles to development strategy, Vestnik of TSUAB, 6 (2014), p. 9-24.

<sup>14</sup> S. Parkin, Sustainable development: the concept and the practical challenge, Proceedings of the ICE-Civil Engineering, 6 (2000), p. 3-8.

<sup>15</sup> A. Finco, P. Nijkamp, Pathways to urban sustainability, Journal of Environmental Policy & Planning, 3 (2001), p. 289-302.

<sup>16</sup> UN World Economic and Social Survey, "Towards Sustainable Cities", 2013, available at: [https://www.un.org/en/development/desa/policy/wess/wess\\_current/wess2013/Chapter3.pdf](https://www.un.org/en/development/desa/policy/wess/wess_current/wess2013/Chapter3.pdf), last visited on 14 November 2019.

<sup>17</sup> Field, S., Case Study: Vauban. Freiburg, Germany. In N. Foletta & S. Field (Eds.), Europe's Vibrant New Low Car(bon) Communities. New York: Institute for Transportation & Development Policy, (2011).

spaces where geosphere and other natural resources took place. Thus, there is a pressing need to ensure that cities are converted into sustainable cities.

Vonkeman, one of the forerunners in promoting the concept of Sustainable Cities, offered a four-phase methodology for achieving regional sustainability.<sup>18</sup>In the first phase, scientific persons or other people of expertise are to introduce the concept of sustainable development and the nature, along with proposing sustainability indicators to generate a discussion among stakeholders. In the second phase, a vision is to be developed along with an implementation strategy and programmes with defined responsibilities of stakeholders. The third phase is the operational stage wherein the operational strategy and actions meet the targets. In the final stage, the strategy and actions are elaborated and a final consensus is achieved to finally implement the strategy.

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## **B. SMART CITY V/S SUSTAINABLE CITY AS A SOCIAL CONCERN**

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The last two decades have witnessed the growth of metropolitan cities across the globe whose primary objective has been to improve urban infrastructure and services, aiming at a better environment, social and economic conditions by increasing the “attractiveness” of the city.<sup>19</sup> It is with this idea that the genesis of ‘Intelligent cities’ came into existence.<sup>20</sup> This concept was the predecessor of “smart cities” which arose due to the intelligent use of digital information, in the areas such as human health, mobility, energy use, education, knowledge transfer and urban governance.<sup>21</sup>

The concept of “Sustainability” and “Sustainable Urban Development” consists of several themes and concepts including smart urbanism, smart economy, sustainable and smart environment, smart technology, smart energy, smart mobility, smart health, and so on.<sup>22</sup>It is estimated that about 70% of the world’s population will be living in cities by 2050 due to the immense opportunities cities are considered to offer with respect to education and

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<sup>18</sup> Vonkeman, G.H, Sustainable Development of European Cities and Regions, (2000), pp.101-142.

<sup>19</sup> Bollens, Scott. “In Through the Back Door: Social Equity and Regional Governance.” Housing Policy Debate 13, no. 4 (2003): 631–657.

<sup>20</sup> CDFI Data Project, Community Development Financial Institutions: Providing Capital, Building Community, Creating Impact, 2003, last accessed 15 August, 2019, [www.cfed.org/enterprise\\_development/CDFIData](http://www.cfed.org/enterprise_development/CDFIData).

<sup>21</sup> Davis, Mike, Planet of Slums. London: Verso, (2006).

<sup>22</sup> Kubisch, Anne, Comprehensive Community Initiatives: Lessons in Neighborhood Transformation, (1996), last accessed 2 August, 2019, [www.nhi.org/online/issues/85/compcominit.html](http://www.nhi.org/online/issues/85/compcominit.html).

work.<sup>23</sup>With an ever growing population, the consumption of resources and services are also high, making it all the more imperative to ensure sustainability in planning.

A sustainable city or eco-city model is built on social development, economic development, environmental management and urban governance to ensure having “*low ecological footprint*” and eliminate transferring economic, social and environmental hazards to other locations and future generations.<sup>24</sup>The world today is struggling with hundreds of environmental hazards and problems including climate change, increase in carbon emissions resulting in green-house gases, depletion of the ozone layer and pollution of different bodies.<sup>25</sup>

Sustainable Smart City aim to improve the *quality of life* of its residents with an increased efficiency of urban operation, services and competitiveness while ensuring at the same time that such a development also meets the needs of the future generation and saves enough resources for them.

Thus, there exists a *three-fold characterization* of a Sustainable Smart City: Sustainability, which is ensured through reducing pollution levels, complying with the requirements of Climate Change Conventions etc through governance policies, quality of life, which is characterised through improvements in financial and emotional well-being and intelligence, which involves improving economic, social and environmental standards. Sustainable Smart Cities must also be designed in such a manner so as to be resilient to natural as well as man-made disasters.

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### C. ROLE OF URBAN PLANNING IN THE MAKING OF A SUSTAINABLE CITY

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Urban Sustainability works along the lines of digitalisation and technological advancements.<sup>26</sup> In order to meet the interests of public at large and to emphasise on the role of sustainability on urban planning, even the United Nations have stressed on its importance and stated that the aim must be to “*make cities and human settlements inclusive, safe, resilient and sustainable.*”<sup>27</sup>

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<sup>23</sup> Smith, A. An Inquiry Into the Nature and Causes of the Wealth of Nations (1776), Dent, (1910).

<sup>24</sup> Urban Land Institute, Mixed Use Development Handbook, Urban Land Institute, Washington, (1987).

<sup>25</sup> Redclift, M., Sustainable Development; Exploring the Contradictions, Methuen, London, 1987.

<sup>26</sup> A. Finco, P. Nijkamp, Pathways to urban sustainability, Journal of Environmental Policy & Planning, 3 (2001), p. 289–302.

<sup>27</sup> UN OWG, 2015

The role of urban planning in the making of a sustainable city is extremely important in order to ensure maximum capitalisation of the available funds and resources.<sup>28</sup> Further, urban planning is essential to strike a balance between the needs of the environment and natural resources and at the same time, improving the quality of life and ensuring development in terms of social, economic and technological levels.<sup>29</sup> It is only then that the needs of a city to change in terms of making it more habitable for its residents, attractive for business transactions and better infrastructure will be met.<sup>30</sup>

### **PART III: SUSTAINABLE CITY AND WASTE MANAGEMENT SYSTEM**

#### **A. SOCIAL IMPACT OF SUSTAINABLE CITY AND WASTE MANAGEMENT SYSTEM**

The waste management system of every country has achieved importance in the recent years with industrialisation bringing in notable changes in the waste management system of a couple of nations. The rural urban shift, rapid and massive population explosion particularly in the African, Asian and South American nations have also enhanced the pollution levels in the environment.<sup>31</sup> The waste management system of the country is often touted to be an indicator of the level of development of the nation. Technology, finances, infrastructure and policy execution are some of the aspects which determine the waste management system of the country.<sup>32</sup>

In developing urban areas, waste generally consists of domestic garbage, organic litter, plant leaves, branches, logs, spoiled agricultural produce, crop residues, paper, polythene bags, rags, vehicle scraps, used tires, dusts, mire, plastics, glass, blood, bones, animal skins, hides, leather, urinary and faecal materials.<sup>33</sup> Improper disposal of such waste often leads to the pollution of the air, water, land, vegetable, wildlife and man. Sickness and disease epidemics

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<sup>28</sup> Bartelmus, P., Towards a framework for indicators of sustainable development. New York: United Nations, Department for Economic and Social Information and Policy Analysis, (1994).

<sup>29</sup> Healey, P., Making better places: the planning project in the twenty- first century. New York: Palgrave Macmillan, (2010).

<sup>30</sup> Carmona, M. & L. Sieh, Measuring quality in planning: Managing the performance process. London: Spon Press, (2004).

<sup>31</sup> Darragh T M, Comparison of leachate re-circulation and bioreactor technology, Solid Waste Association of North America's 2nd Annual Landfill Symposium, Sacramento, (1997).

<sup>32</sup> Smith M, Das K, Tollner, Characterization of landfilled Municipal Solid Waste following in-situ aerobic bioreduction, Proceedings of the Composting in the Southeast Conference University of Georgia, Atlanta, (1998).

<sup>33</sup> Leong, K. C. 'Partnerships in Sustainable Development', Keynote Address on Community Participation, 15th EAROPH World Planning Congress, 1996.

result when sewage, garbage wastes and unwanted substances are not properly disposed off and well managed. Another major problem accruing from improperly managed and disposed waste is its potential to cause infection to people residing in adjacent areas, which are usually slums and the contamination of ground water, surface water and air pollution caused by the release of methane in the air when the waste is not burnt properly. Furthermore, industrial waste is more likely to exist in the urban areas of information and training of all on the use of new techniques and methods and the need for the production and/or introduction of other appropriate technology and policy were suggested.<sup>34</sup>

Integrated Solid Waste Management (“ISWM”) System reflects a more comprehensive approach towards waste management through the careful selection and sustained application of the appropriate technology, working conditions and creation of a social license between the community and designated waste management authorities or the local government. It incorporates both the need for high professionalism among the waste managers as well as cooperation from the community at large for the successful local or global ecosystem to be established.

The modus operandi of ISWM is based on the model of the 3-1 R’s, first proposed by Ontario’s Pollution Probe in the early 1970’s, which are reduce, reuse and recycle and the fourth R being ‘Recovery.’ This hierarchy has been formulated after considering environmental, financial, social and management considerations and aims to minimise Green House Gases emissions.

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## **B. DIFFERENT KINDS OF WASTE MANAGEMENT SYSTEMS**

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The waste management system in most countries can be categorised as belonging in one of the categories listed below:

### **1. WASTE REDUCTION:**

This method involves redesigning the product by changing the patterns of production and consumption. Waste or source reduction initiatives primarily based on the “Reuse” model fall under this category and aims at solving the problem of waste management at the grass root level by reducing the garbage generation in the first place. This will help in solving the

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<sup>34</sup> Hanashima M, Pollution control and stabilisation process by semi-aerobic landfill type; the Fukuoka method Proceedings of Sardinia '99, 7th International Waste Management and Landfill Symposium Environmental Sanitary Engineering Centre (CISA), Cagliari, Italy 1, (1999).

problem of release of greenhouse gases by firstly, avoiding the emissions resulting from the manufacture of the product and secondly, by avoiding the emissions resulting from the waste management systems.

2. RECYCLING AND MATERIALS RECOVERY:

This method focuses on the “Recycling” aspect of waste management aiming at reducing the quantity of waste disposal and the return of materials to the economy. In developing economies, rag pickers play a major role in this kind of waste disposal. China, for example, is considered to recover about 20% of such waste through informal waste picking.<sup>35</sup> Since informal picking has little to do with emissions, this in itself is an eco- friendly disposal mechanism.

3. AEROBIC COMPOSTING AND ANAEROBIC DIGESTION:

This involves the process of composting in an enclosed vessel in the presence of oxygen. This is to ensure that the formation of methane is avoided. Anaerobic digestion will result in methane which will either flare or generate heat. This process is useful in significantly reducing the contamination of the compost and thereby ensures more eco- friendly waste disposal.

4. INCINERATION:

This is considered to be the most efficient method of waste disposal system since it is considered that it can reduce the volume of waste disposal up to about 90%. However, in order to achieve this level of success through this method, there must exist waste streams with extremely high amounts of packaging material, paper, cardboard, plastics etc. Thus, it is not just a mere environment friendly method for it discourages open burning of waste, but also a more pocket friendly and relatively cheaper mode of waste disposal.

5. LANDFILL:

Landfill is the final step of the waste disposal system in a way. It is the place where the waste or residue from other processes is deposited for the last time. The engineering, design, monitoring and constant observation of these landfills is extremely important to ensure protection to the environment as well as public health. Landfills produce anaerobic decomposition of organic matter which can be recovered with about 50% of the methane

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<sup>35</sup> Wang QR, Cui YS, Liu XM, Dong YT, Christie P, Soil contamination and plant uptake of heavy metals at polluted sites in China. J Environ Sci Health, 38 (2003), p. 823–838.

burnt with, thereby reducing the emission of greenhouse gases. However, poor infrastructure and implementation of this waste disposal mechanism has often led to its failure leading to more harm than good.

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### **C. WASTE AND CLIMATE CHANGE**

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One of the biggest concerns of Waste Management Systems across the world is the greenhouse gas emission which have resulted from the emission of methane in the atmosphere which is a major cause of total greenhouse gas emissions. In order to prevent this, apart from improving the logistics of the waste management system is encouraging waste minimisation through various programmes to uplift the MSW programs.

Presently, methane from landfills are contributors to approximately 12% of the global methane emissions, which constitute half the methane emissions attributed to the municipal waste sector.<sup>36</sup> However, the level of methane produced by each landfill differs according to the country, size of the landfill, climatic conditions and changes taking place in the area and the general waste management practices. For example, while organic biomass decomposes anaerobically, landfill gas is a by-product of anaerobic decomposition of composed methane. The burning of plastics also leads to the second highest production of greenhouse gases, highest only after the carbon- dioxide production.

Greenhouse Gas Mitigation Opportunities makes an effort to reduce the emission from Municipal Solid Waste sector including generating less waste, improving the efficiency of waste collection, expanding the application of the three golden R's, methane avoidance and so on. It also encourages the stricter implementation of the Waste Management Laws which have been elaborated below.

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### **D. GLOBAL STAND ON WASTE MANAGEMENT SYSTEMS**

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Generally, it is noticed that the system of waste disposal in most other parts of the world, particularly in advanced countries is extremely eco-friendly with proper methods for the treatment of waste and the consequent gases generated by it.

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<sup>36</sup> IPCC, Climate Change: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, (Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller, 2007).

It is estimated that about 62% of the solid waste generated in the United States is disposed of by landfills, which have shifted from being open dumps to being dry entombments, in accordance with the US Environmental Protection Agency.<sup>37</sup> According to the system of waste disposal followed in the US, anaerobic waste decomposition method is followed to ensure that there is no potential threat to human health and the environment. The decomposition of the waste involves a biological, chemical and physical processes. The process of fermentation then converts the waste into landfill leachate. The US also have a legislation known as the Clean Air Act, under which certain plausible gases which may be produced as a result of the fermentation falls under the definition of greenhouse gases.<sup>38</sup> Thus, it is the duty of the owners and users of these landfills to ensure compliance with these measures for which appropriate guidelines have also been given.<sup>39</sup>

European Countries have often set examples in following some of the best waste disposal practices in the world.<sup>40</sup> Germany for example, has used waste management as a method of generating business opportunities in accordance with a strict legislation governing the same.<sup>41</sup> Since 2005, they have banned the use of garbage dumps and recycle the waste to generate electricity which not only saves them billions of euros but also ensures a more sophisticated management of the waste. They follow a system of “green dot” or producers’ responsibility. This results in the use of thinner paper, glass or any other material used for packaging of the product.<sup>42</sup>

Austria uses taxes and incentives in order to promote a more environment friendly manner of waste disposal. Biotech Companies use a new high-tech mechanism to convert the waste to recycle Polyethylene terephthalate with the use of fungal enzymes. Thus, 100% of the waste generated can be recycled through this method.<sup>43</sup>

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<sup>37</sup> US Environmental Protection Agency (EPA), Municipal solid waste basic facts, (2004), last accessed on 17 August, 2019, <http://www.epa.gov/epaoswer/nonhw/muncpl/facts.htm>

<sup>38</sup> The Clean Air Act, 1963, 42 U.S.C. § 7401.

<sup>39</sup> United States Environmental Protection Agency (USEPA), Solid waste management: a local challenge with global impacts, (2002), last accessed on 15 November, 2019, <http://www.epa.gov/osw/nonhaz/municipal/pubs/ghg/f02026.pdf>.

<sup>40</sup> Krämer, L., EU Casebook on Environmental Law (Hart Publishing, 2002).

<sup>41</sup> Closed Substance Cycle Waste Management Act, 1994.

<sup>42</sup> Fischer, L. and Petschow, U., Municipal waste management in Germany, (N. Buclet and O. Godard, Municipal Waste Management in Europe, Kluwer Academic Publishers, 2000).

<sup>43</sup> Helen Albert, “Carbios Creates First 100% Recycled Plastic Bottles with Enzymes”, Labiotech.eu, 27 February 2019, available at: <https://www.labiotech.eu/industrial/carbios-biorecycled-plastic-enzymes/>, last visited on 28 November 2019.

Belgium is known to have the best diversion rate in the world. It is one of the top performers in waste management under a comprehensive legislature existing for management of the same. Their system of waste management can be bifurcated into two: the Ecolizer and the Assessment guide. The former takes into account the system of transportation, processing, energy and waste treatment and is a calculator which promotes sustainable design of the waste disposal system. The latter on the other hand, helps access the waste management system and calculate the effectiveness of the mechanism.<sup>44</sup>

Some of the largest landfills in the world include the Great Pacific Garbage Patch, which is almost the size of Texas, extending over the Pacific Ocean. One of the largest landfills in China is the Xinfeng landfill, which was made in 2003 with an estimated lifespan of 20 years. Each day, approximately 7000 tonnes of waste generated is dumped into this landfill. However, the landfill is said to be equipped with a leachate collection system, methane recovery and treatment system.<sup>45</sup>

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#### **E. CURRENT SCENARIO IN INDIA**

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The concept of Smart Sustainable Cities in India has been gaining much attention of policy makers and bureaucrats through various seminars, lectures and discussions. In 2015, there was a discussion held at Bangalore in furtherance of developing Bangalore into a Sustainable Smart City wherein many plausible ideas and schemes were discussed.<sup>46</sup> The urban challenges and the problems were also discussed at length. One of the main goals of this project is to make the cities self-sufficient to a large extent for which better transport facilities within the city as well as its connectivity with other cities is to be considered and make it a more Global User-Friendly City. For example, while the use of plastic should be minimalised, residents must be given an alternative which is not just eco-friendly but at the same time either cheaper or of the same price. In the absence of meeting this requirement, it may be a sustainable development but it will be difficult to implement the smart city programme.

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<sup>44</sup> Koeman, N., *Environmental Law in Europe*, (Kluwer Law International, 1999).

<sup>45</sup> Gheorghe Duca, Aliona Mereuța, *Solid Waste Management in the Republic of Moldova*. Proceedings of the Eleventh International Conference on Management Science and Engineering Management, 2018, p. 1283-1295.

<sup>46</sup> Vanya Rakesh, "Sustainable Smart Cities India Conference 2015, Bangalore", The Centre for Internet and Society, 21 September 2015, available at: <https://cis-india.org/internet-governance/blog/sustainable-smart-cities-india-conference-2015-bangalore>, last visited on 03 December 2019.

The vision behind implementing such a programme is to have well-planned employment and economic activities, decentralized approach catering to the need of society and economics. There should be economic opportunity in jobs with affordable housing, entertainment activities and economic activities co-existing in a balanced manner. There should be good connectivity of gas pipelines and energy supply across the country. Innovative waste disposal mechanisms must be implemented at a national and municipal level which must inculcate the concept of eco-friendly disposal of waste. More modes of public transport such as metro and mono-rail must also be implemented.

Waste Management is one of the most important problems which has plagued India since time immemorial.<sup>47</sup> It is estimated that as a country, we generate approximately 62 million tonnes of waste out of which about 5.6 million is plastic waste while 0.17 million is biomedical waste and a large proportion also belongs to e-waste.<sup>48</sup> Lack of treatment and proper disposal mechanism leads to the generation of hazardous wastes in large quantities including the production of methane gas.<sup>49</sup> This results in the production of greenhouse gases, causing large scale damage to the environment.<sup>50</sup> Generally, India has followed the landfill form of waste disposal with some of the largest landfills in the world being in India, namely, the Deonar landfill in Mumbai<sup>51</sup> and the Delhi landfill.<sup>52</sup> Rapid industrialisation over the years has resulted not just in the generation of huge quantities of wastes but has also created the problem of e-waste generation.<sup>53</sup> There are very limited treatment, storage and disposal facilities currently existing in India,<sup>54</sup> particularly, in the states of Maharashtra,<sup>55</sup> Gujarat and

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<sup>47</sup> PPCB (Punjab Pollution Control Board), Status report on municipal solid waste in Punjab, Punjab Pollution Control Board, Patiala, (2010), last accessed on 19 October, 2019, <http://www.ppcb.gov.in/Attachments/Annual%20Reports/AR201011.pdf>.

<sup>48</sup> Government of India, Press Information Review, Javadekar, Ministry of Environment, Forest and Climate Change, Solid Waste Management Rules Revised After 16 Years; Rules Now Extend to Urban and Industrial Areas, last accessed on 16 October, 2019, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=138591>.

<sup>49</sup> Avick Sil, Sunil Kumar, Waste Characteristics and Generation. Sustainable Solid Waste Management, (2016), p. 7-34.

<sup>50</sup> Narayan T., Municipal solid waste management in India: from waste disposal to recovery of resources? Waste Manage, 29, (2008), p.1163–1166.

<sup>51</sup> Volume 2 Issue 5, Karan V Jagasia, Pooja V Jagasia, Solid Waste Management-Survey in Mumbai Region, VES College of Arts, (2017).

<sup>52</sup> Kumar S, Bhattacharyya JK, Vaidya AN, Chakrabarti T, Devotta S, Akolkar AB, Assessment of the status of municipal solid waste management in metro cities, state capitals, class I cities, and class II towns in India: an insight. Waste Manage, 29, (2009), p. 883–895.

<sup>53</sup> Pratyusha Basu, Jayajit Chakraborty, Environmental justice implications of industrial hazardous waste generation in India: a national scale analysis. Environmental Research Letters 11:12, (2016).

<sup>54</sup> Arup Das, Taraknath Mazumder, A.K. Gupta, A Methodology to Design a Composite Accident Index and Assess the Links in a Network Carrying Hazardous Waste: A Case Study of Kolkata Metropolitan Area. Transportation Research Procedia , 17, (2016), p. 273-281.



sectors are of prime importance to the process of recycling and reusing waste.<sup>61</sup> They collect garbage, thereby helping to keep the city clean and further, help in segregating the same. A large part of the waste disposal system in India is dependent on them, though we largely fail to value their contribution.<sup>62</sup>

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## F. INTERNATIONAL TREATIES AND CONVENTIONS

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### 1. INTERNATIONAL CUSTOMARY LAW

The sovereignty of the State is considered to be the general rule and principle of law which was highlighted in Principle 2 of the Rio Declaration. States by virtue of this declaration have the right to exploit their own natural resources but not cause transboundary environmental damage. In furtherance of this principle, it is the duty of the state to ensure that the waste it generates is disposed off in accordance with this principle by ensuring that it does not cause any harm to the environment.<sup>63</sup> Even the precautionary principle has weightage in the instant case since it is the duty of the state to ensure that the manner of disposal of waste does not result in possible damage to the environment even in the future, through the spread of hazardous gases or material which it may fragment into.<sup>64</sup>

### 2. INTERNATIONAL TREATIES

With respect to waste management, there are primarily two treaties which play a major role in waste management.

#### ***London Convention, 1972***

This convention provides that dumping, unless expressly prohibited is permitted. While this approach was reversed in a later protocol preventing any sort of dumping activity in the sea, is a reflection of the precautionary principle being applied.

#### ***Basel Convention 1989***

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<sup>61</sup> Bhalla B, Saini MS, Jha MK., Effect of age and seasonal variations on leachate characteristics of municipal solid waste. Int. J. Res. Eng. Technol. 2, (2013), p. 223–232.

<sup>62</sup> Kaushal RK, Varghese GK, Chabukdhara M., Municipal solid waste management in India—current state and future challenges: a review. Int. J. Eng. Sci. Technol. 4, (2012), p. 1473–1489.

<sup>63</sup> Brinkhorst, L. J., European Environmental Law: an Introduction, N. Koeman (ed), Environmental Law in Europe (Kluwer Law International, 1999).

<sup>64</sup> De Sadeleer, N., Environmental Principles: From Political Slogans to Legal Rules (Oxford University Press, 2002).

This convention is the continuation of the principle enshrined in the London Convention as well as the 1996 Protocol. However, it provides a stricter standard for the prevention by prohibiting the shipment of hazardous waste to other countries.<sup>65</sup>

### 3. VIENNA CONVENTION

This Convention provided for the protection of the Ozone Layer, by means of cooperation among the parties and adaptation of legislative or administrative activities in furtherance of prevention of the possible adverse effects on the Ozone Layer. The Montreal Protocol was signed in furtherance to this to meet the object of this Protocol. It is important in urban planning and ensuring Sustainable Development since the waste management systems as well as the entire concept of Green Construction is based on prevention of release of greenhouse gases in order to prevent the depletion of the ozone layer.

### 4. STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

This treaty aims at protecting human health and environment from Persistent Organic Pollutants and provides a range of control measures to reduce and eliminate the release of POP's. Thus, in accordance with this convention, it is required that the signatories dispose off garbage in such a manner as to ensure that POP's are not released. Further, even in implementing the concept of smart city, this should be kept in mind.

### 5. UNFCCC

There has been an attempt to stabilize greenhouse gas concentrations ever since 1992 by Parties to the United Nations Framework Convention on Climate Change (“UNFCCC”),<sup>66</sup> with an aim to prevent dangerous anthropogenic interference with the climate system.<sup>67</sup> However, it has not been effectively implemented. The reason behind so is the wide disparity in states' ability to handle climate change as well as disproportionate means to contribute to climate change mitigation.<sup>68</sup> Presently, climate change is largely applicable to the concept of smart city and waste management systems thereunder since one of the main aims of a smart city is to mitigate the problem of climate change and to comply with commitments under this Convention. Further, an effective system of waste management, particularly one which will

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<sup>65</sup> Kummer, K., International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules (Oxford: Oxford University Press, 1999).

<sup>66</sup> United Nation Framework Convention on Climate Change, Art. 14(8), 9 May 1992, 1771, U.N.T.S. 107 UNTS 107.

<sup>67</sup> United Nation Framework Convention on Climate Change, Art. 14(8), 9 May 1992, 1771, U.N.T.S. 107, Art. 2.

<sup>68</sup> Annalisa Savaresi, The Paris Agreement: A New Beginning? Journal Of Energy & Natural Resources Law (January 2015).

result in the proper treatment of garbage and convert the same into energy is likely to reduce green-house gas emissions, thereby helping to meet the cause of climate change.

#### 6. KYOTO PROTOCOL

The Kyoto protocol was adopted under UNFCCC in the year 1997,<sup>69</sup> with the aim of reducing the financial disparity gap between the countries. It realised the difference between developed and developing countries and a responsibility was imposed on the developed countries to reduce emission to a certain level which was a binding target.<sup>70</sup> One of the mechanisms developed under this protocol is the Clean Development Mechanism (CDM) which allows emission-reduction or removal projects in developing countries to earn certified emission reduction credits, equal to one tonne of CO<sub>2</sub>, which can then be traded and sold with other industrialised country. Use of this mechanism by Indian based companies who contribute to Green Construction or other aspects of building a smart city and generating more effective waste management mechanisms will also boost the industries in India.

#### 7. PARIS PACT

The Paris Climate Change Conference was held with the aim to bring an end to all negotiations and reach to a final binding legal agreement between all parties, which would be implemented from 2020. The agreement covers substantive areas such as mitigation, adaption and implementation means.<sup>71</sup> This treaty is formally binding on the parties.<sup>72</sup> However, it gives the parties discretion due to the 'bottom up' approach, as to how to tackle climate change. There is an aspirational goal of 1.5 C, global highest greenhouse gas emissions.<sup>73</sup> It also provides for compliance with certain Nationally Determined Contributions (NDC) levels. In order to meet these levels, sustainable development, urban planning is extremely important in order to ensure lesser generation of greenhouse gases. Proper waste disposal system will ensure the same by reducing the release of methane in the atmosphere, thereby reducing the greenhouse gases.

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<sup>69</sup>Kyoto Protocol (Kyoto, 11 December 1997, In Force 16 February 2005) 2303 UNTS 262.

<sup>70</sup> Annalisa Savaresi, The Paris Agreement: A New Beginning? Journal Of Energy & Natural Resources Law (January 2015).

<sup>71</sup> Paris COP Decision & Paris Agreement, Arts. 4, 5, U.N. Doc. FCCC/CP/2015/L.9/REV.1, (12 Dec. 2015), Art. 4.

<sup>72</sup> Daniel Bodansky, The Legal Character Of The Paris Agreement: A Primer, (December 2015).

<sup>73</sup> Paris COP Decision & Paris Agreement, Arts. 4, 5, U.N. Doc. FCCC/CP/2015/L.9/REV.1, (12 Dec. 2015), Art. 2.

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**G. INDIAN RULES AND LEGISLATIONS**

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**1. ENVIRONMENTAL PROTECTION ACT, 1986**

This Act confers upon the Central Government the power to regulate all kinds of waste. Section 7 of the Legislation prevents any harm to the environment due to discharge of excess of environmental pollutants. The polluter pays principle is also enshrined in Section 9(3) of this Act which provides for the person responsible for the damage to the environment bearing the cost of restoration of the environment to its natural state.<sup>74</sup>

This legislation will ensure that the people in charge of the management of the landfills and other system of urban planning, including those involved in green construction, recycling of plastic etc perform their duties well.

**2. MUNICIPAL SOLID WASTES (MANAGEMENT AND HANDLING) RULES, 2000**

This Rule holds the local Municipality accountable for infrastructure and waste segregation in furtherance of processing of solid waste. It also enshrines a duty upon the Central Pollution Control Board of India to submit an annual report to the Ministry of Environment and Forest every year along with recommendations for the process of solid waste management.

**3. WASTE MANAGEMENT RULES, 2016**

The 2016 Amendment increased the scope of applicability of the rules by also bringing under its ambit railways, airports, airbase and so on. Further, these rules have laid down clearly demarcated responsibilities even of the generators responsible for segregating the waste. It also suggested the formalisation of rag-pickers and other informal sectors involved in the collection of waste. It even provides that non-recyclable waste above a particular limit cannot be dumped in landfills. Rather, it must be used to generate energy though fuel or fossil driven fuel.

**4. THE HAZARDOUS WASTES (MANAGEMENT, HANDLING AND TRANSBOUNDARY MOVEMENT) RULES, 2008**

These rules provide that the person in charge of the plant or factory producing hazardous waste due to its operation must sell it to a re-processor or recycler authorised by the government to dispose the waste in a safe manner. This provision is useful in the management of industries which are an inevitable part of smart cities.

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<sup>74</sup> OECD. The Polluter Pays Principle, Paris, OECD, 1975.

#### 5. THE PLASTIC WASTE (MANAGEMENT AND HANDLING) RULES, 2011

These rules control the manufacture, use and recycling of plastic waste. They have been amended in 2016. In Maharashtra, the extent of the applicability of these rules is questionable with the recent plastic ban.

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### **H. THE DEONAR DUMPING GROUND**

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Despite the immense amount of waste being generated in Mumbai, there only exists three main landfills in the city, the primary and the oldest one being the Deonar Dumping Ground which is managed by the Brihanmumbai Municipal Corporation. However, this has not been managed properly over the years with multiple incidents of break out of fire and the ground now becoming a breeding haven for mosquitoes, rats, flies and stray animals. Further, the dumping ground has been over utilised and overburdened much more than its capacity with heaps and heaps of garbage being dumped each day. This garbage is not treated resulting in the release of methane, thereby causing frequent fires. These fires cause a thick blanket of smoke, thereby affecting more than 48% of the Mumbai population. Further, this garbage continues to lie untreated in the yard. Thus, all the respondents have suggested that it be put to better use with 58.6% suggesting the conversion of the waste to energy method.

#### 1. GOVERNMENTAL MEASURES

The Brihanmumbai Municipal Corporation has over the years made little attempt at reducing pollution levels. In case of most of the fires at Deonar, the authorities have simply resorted to playing the blame game and thereby accusing the informal sector, particularly the ragpickers of being the cause behind the occurrence of the frequent fires. However, over the years, there has been a stricter adoption of the waste segregation method or scheme wherein even at the household level, waste is segregated into recyclable and non-recyclable, degradable and non-biodegradable waste. Recently, the government also implemented a ban on plastics above a certain level. These has also been backed by the imposition of hefty fines in case of violation of the ban and thereby the use of plastic. Thus, this is being complied with by a large number of people, though there is no authoritative statistics to back up the same since it has been enacted very recently.

The fire in Deonar has been so severe with such bad smog that even the NASA reported to have been able to indicate the smoke arising from the fire, the picture of which has been

provided below. Thus, there is a necessity for the government to take urgent action on this front after identifying and acknowledging the problem.



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## I. RECENT JUDICIAL INTERVENTION

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The judiciary has played a vital role in controlling the pollution levels in Mumbai. In amidst of great hue and cry, the Bombay High Court had looked into the situation of the Deonar Dumping ground in the light of the repetitive fire incidents being reported due to a FIR which was filed in furtherance of the same.<sup>75</sup> In February, 2016, the Bombay High Court had ordered the Deonar and Mulund dumping grounds to be shut down after observing that they had reached their saturation points. However, in the light that there was no other viable option for waste disposal, the Bombay High Court allowed the grounds to operate till June 2017 and directed the government to look for an alternate garbage disposal ground. However, over time, the BMC has been extending this period which was till October 2017. Justice Oka who was hearing this case also observed the immense amount of garbage generated and the high risks involved in allowing the grounds to operate. Yet again, in August, 2018, a two-judge bench has directed the BMC to look into this matter urgently and come up with better solutions for waste management. However, the present researcher has not surveyed the

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<sup>75</sup> Municipal Corporation of Greater v. Shri. Pandurang Patil, Civil Application NO.221 OF 2013.

awareness among the public regarding the judicial intervention in this matter since there is a lot of discrepancy regarding the extension of time being granted to BMC for the same.<sup>76</sup>

The Hon'ble Supreme Court, in the case of *Almitra H. Patel & Anr. v. Union of India & Ors.* has also held that the inefficiency of the staff, coupled with increased domestic garbage, sewage and poor drainage system have heavily contributed to the problem of solid waste.<sup>77</sup> The Court in this case, also provided suggestions to the State and Central Governments, including monitoring and identifying open dumps, increasing 'zero garbage towns' and ensuring strict compliance with MSW rules.

As recently as in 2019, the National Green Tribunal, has issued directions to develop institutional training mechanisms involving technical, social and environmental issues for training officers concerned with enforcement of environmental norms at the grassroots level.<sup>78</sup>

### CRITICAL ANALYSIS

The concept of waste management is governed by legal and social concepts of sustainable development, precautionary and polluter pays principle. Each of the aforementioned principles have been legally recognised and have emerged out of principles of equity and due to social demands. They enshrine a responsibility upon municipalities and commercial establishments to act in an environmentally viable and accountable manner in terms of framing the policies and legislative framework. Economic development has resulted in a tremendous increase in waste generation in India. This has further increased the burden on authorities to emphasise on waste segregation and safe disposal system.

It is the three R's which are integral in ensuring safe waste disposal system, to reduce generation of greenhouse gases, prevent spread of diseases or epidemics, protection of the ecosystem and biosphere and ensure hazardous substances are safely disposed off amongst other objectives. Hence, several governments have been attempting to reduce the use of plastics in households. A 2016 report released by IIT Kanpur also found an opportunity of providing employment to about 5,00,000 rag-pickers and recovering at least 15% of waste

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<sup>76</sup> R.N. Bhaskar, *The Deonar fire: Why can't Mumbai be smarter and manage its waste like the Swedes do*, (19 August 2018), last accessed on 20 August 2019, <https://www.firstpost.com/india/the-deonar-fire-why-cant-mumbai-be-smarter-and-manage-its-waste-like-the-swedes-do-2689738.html>.

<sup>77</sup> *Almitra H. Patel and Anr. v. Union of India and Ors.*, (2000) 2 SCC 678.

<sup>78</sup> *Compliance of Municipal Solid Waste Management Rules, 2016 (Union Territory of Lakshadweep)*, Original Application No. 606/ 2018.

generated everyday in the country, with the support of not-for-profit organisations and the general community.<sup>79</sup> Societies and community centres across India have now started emphasising on waste segregation in households, and imposing fines to deter deviance from the same.

However, it is interesting that over three-fourths of the budget allocation towards waste management is allotted to collection and transportation, leaving little for processing or resource recovery.<sup>80</sup> Yet, rarely are even basic equipments provided to rag-pickers or others employed to collect and transport the waste.

The concept of common waste treatment facility has been widely promoted and has garnered attention in the recent decade. It involves the use of waste as a resource, wither by using it as a co-fuel or co-raw material in the manufacturing process. Several Public-Private-Partnerships have emerged from this concept, thereby increasing employment opportunities in this sector.

Over the past decade and more, the Deonar Dumping ground in Mumbai has had multiple instances of fires and smoke emanating from the pile of dump. This has particularly been affecting the residents of Chembur, Markhund and other adjoining regions. However, the air pollution resulting from the fires have reduced the quality of air across Mumbai. With another incident of fire as recently as in 2018 and the civic authorities refusing to acknowledge the issue and take necessary action, it is pertinent to understand the perspective of the residents of Mumbai and whether there actually is a necessity to bring any change in the method of Waste Management as it currently exists in the city. It is also, important to test their awareness about the environment, climate change, sustainability and so on in the light of this issue.

### SUGGESTIONS AND RECOMMENDATIONS

- Public awareness and education must be spread about the state of the waste management system in across all cities in India along with information about the

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<sup>79</sup> Rajkumar Joshi and Sirajuddin Ahmed, Status and Challenges of municipal solid waste management in India: A review, Cogent Environmental Science (2016), 2: 1139434 <http://dx.doi.org/10.1080/23311843.2016.1139434>, last visited on 2 December 2019.

<sup>80</sup> Isher Judge Ahluwalia, "Cities at crossroads: Recycling begins at home", November 30, 2016, available at: <https://indianexpress.com/article/opinion/columns/waste-recycling-organic-energygy-garbage-management-disposal-pollution-metro-cities-4402086/>, last visited on 03 December 2019.

manner in which waste is disposed off in the city. Only public awareness and education on the need for efficient waste management system can bring about a change in the executive and legislative policies.

- The Bombay High Court must take stricter action and give a specific deadline to the BMC to come up with an alternative mechanism or dumping yard, failing which action should be taken against them. Continuous postponement of such deadlines should be strictly avoided. Similarly, other High Courts must also take *suo moto* action in their respective states, demanding reports from their respective state governments as to the manner of waste disposal, the recyclable wastes, budget allocation and order expert committee reports to be conducted to promote safe and efficient disposal of waste.
- The kind of waste management mechanisms implemented in countries around the world particularly the Scandinavian nations and European Nation must be considered and similar mechanisms must be implemented in India. Impetus must be given to Indian Industries to make more eco- friendly waste disposal systems. Further, regular assessments and surveys must be carried out about the condition of the dumping grounds and waste disposal mechanisms.
- The conversion of waste to energy schemes must be implemented. Considering the fact that India is a developing nation and may not have adequate resources, knowledge or means to do so, Memorandums of Understanding can be entered into with other countries which have the requisite technology and can help fund such programmes. This will help India in the long run not just in meeting its international commitments and obligations but also in ensuring greater safety to public health and environment.
- As a short term and immediate solution, while plastic ban is a good idea, if there are no perfect substitutes, in the sense that they are in the same price range, same effectiveness and eco- friendly, this scheme will fail to achieve its objective. Thus, cheaper and more viable and durable substitutes must be distributed in an urgent manner to ensure the successful implementation of the scheme.
- There should be a careful watch over the waste collection in urban areas, particularly household or society wise with a strict segregation between biodegradable and non-biodegradable wastes.

- Diversifies waste Processing Technology seems to be one of the most effective solutions in effectively managing the waste. Merely collecting them in a segregated manner is not sufficient. It is also necessary to process them individually, according to the chemical, biological and physical process which is appropriate for the treatment of the waste. Thus, a combination of various techniques must be given.
- Authorities should be directed, through various expert bodies, like the IIT's which have made similar reports in the past, to analyse the current situation of waste management and suggest viable alternatives along with recommendations and solutions for a more environment friendly future with effective waste management.

## CONCLUSION

Waste management is an integral part of every society. Without an efficient system of waste management, no society can function. It will result in absolute chaos, spread of epidemics and an unhealthy atmosphere, with rapid environmental degradation. Several methods have been identified by the international community for waste collection and disposal. This includes informal and formal methods of waste collection. Several more developed nations such as Singapore, Austria and Belgium have emerged as stalwarts in creating an efficient system of waste disposal, promoting the active recycling of waste and reducing carbon footprints and dumping of wastes.

Although there is little customary international law specifically governing the subject of waste disposal, several regional and domestic instruments have emerged across nations with that objective. However, India is far from efficient in promoting the recycling of its waste into energy, or simply in ensuring safe disposal of wastes. There are several overflowing dump yards, with frequent incidents of fire across them. Heaps of garbage collected as a mountain in these dump yards have also resulted in the depleting health conditions of the population living in the surrounding vicinity. Thus, it is imperative for the government and the legislative to take more active measures for promoting conversion of waste into energy, creating a healthy atmosphere around the dump yards by shifting them to the outskirts of the city and segregating waste, and taking other such measures as necessary to promote public health, and prevent environmental degradation.

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