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Analysis Of Solid Waste Municipal Corporation For Developing Management System In Moradabad-A Review Article

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ABSTRACT

Moradabad is a small town in the western part of the state of the Uttar Pradesh, in northern India. The geographical area of the Moradabad is 70 sq. Km. The East. It has an average elevation of 186 meters. The total population of the city is 27, 61,620 out of which males are 14, 94,220 and females are 12, 67,400. It lies within the great Gangetic plain, and is demarcated into three subdivisions of a submontane country, with an elevation slightly greater than the plain below, and is traversed by numerous steams descending from the Himalayas. There are a about 100 notified slum settlements in the Moradabad city. The approximate slum population is 1, 80,000 in 2010. The percentage of slum population to total population is about 21% in 2010. The steady incremental in the population results in the increase of domestic waste generation. The project deals with the hierarchy of the Solid Waste Management and its major components such as Source reduction, recycling, combustion and landfill.

Solid wastes are all the wastes arising from human and animal activities that are normally solid and are discarded as useless or unwanted. The term solid waste as used in this text is all inclusive, encompassing the heterogeneous mass of throwaways from the urban community as well as the more homogeneous accumulation of agricultural, industrial and mineral wastes. In the early times, the disposal of the human and other wastes did not pose a significant problem, because the population was small and the land available for the assimilation was sufficient enough.

INTRODUCTION

Solid Waste: Waste is the material remains/refused after their use/after serving their purpose. For example: - Remaining of the foods, materials after construction medical waste etc.

Solid waste is the waste remaining after usage / discarded from various human, animal and industrial activities etc. This is form of waste generated in general which needs a proper disposal and handling.

As waste is hazardous for the environment it should be disposed off properly so that hazard potential can be reduced /remove. For proper management of solid waste a environmental planning is essential at each and every level of planning.

According to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal of 1989, Art. 2(1), "Wastes' are substance or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law".

SOLID WASTE GENERATION

There are following sources of solid waste generation

(i) **Residential Waste**: - These are the best generated from household / residential area. Residential waste contains remaining of food, waste paper, plastic items, textile, wood, leather, remaining of Electronics/ electrical items and various refused materials

(ii) **Industrial Waste**: - These are the waste generated from the industries. Industrial waste contains remaining of raw material, construction material, used fuels remaining like ashes, remaining of packaging, handling materials etc.

(iii) **Commercial Waste: -** Commercial waste ids generated from the regular commercial activities like stores, hotels, market and office complexes etc. This type of waste contains papers, plastic, remains of

glass, metal, hazardous waste etc.

(iv) **Institutional Waste**: -This type of waste are generated from the educational area like schools, colleges and coaching centre for Example- remaining of papers, plastic, remains of glass, metal, hazardous waste etc.

(v) **Municipal Services Waste**: - These are the waste generated due to cleaning, landscaping and other municipal activities contains like waste from streets etc.

(vi) **Agriculture Waste**: - These are the waste remaining after the agriculture activities like waste from the remaining of crops, diaries product waste, bottle of pesticides etc.

CLASSIFICATION OF SOLID WASTE

On the basis of origin of generation of waste can be classified as following:

MUNICIPAL WASTE:

As term municipal indicate the inclusion of the municipal area, there contains the waste generated in the municipal area, due to various human / non-human activities.

Generally, these type of waste contains remaining of foods, garbage, remains of papers, tetra-packs, food packaging/ house hold supply packaging remains, cooking oils, dry garbage etc.

These are generated from house hold and need to be proper disposal and handling otherwise can cause damage to the environment.

INDUSTRIAL HAZARDOUS WASTE: These are the waste generated in the industrial area/due to the industrial activities. Generally, this type of waste contains the remains of raw materials, chemicals, refusals of fuels etc.

These types of waste need proper handling and treatment before disposing off. Further this type of waste can be classified as

IGNITABLE WASTE: -

These are waste which can catch fire at low temperature near about 60 degree Celsius and can be burnt during storage / transportation that's why such waste needs proper handling up to disposal.

TOXIC WASTE: -

These are the waste that than can cause harm to the human / others living beings it contacted/consumed in small amount etc for example- pesticides, toxic gases etc.

CORROSIVE WASTES:

These are the waste having corrosive properties and can cause damage example acids etc

REACTIVE WASTES:

These are the waste which do not cause harm in itself but become harmful after coming in contact with other materials for Examples: Gun powder, nitro glycerin etc

BIO MEDICAL HAZARDOUS WASTES:

Bio-medical waste are the remaining of the medicine packaging, various diagnostic kits, packaging of the medicine and remains after the treatment, medical research activities etc.

E-WASTES: - E-waste is the waste generated during manufacturing of electronic and electric gadgets, remains of the electronic and electric gadgets after their service life. Rapid development of the computing industry makes life easier but on the other side it is also creating problem for the proper disposal of the readings of the electrical / electronic items after their useful life.

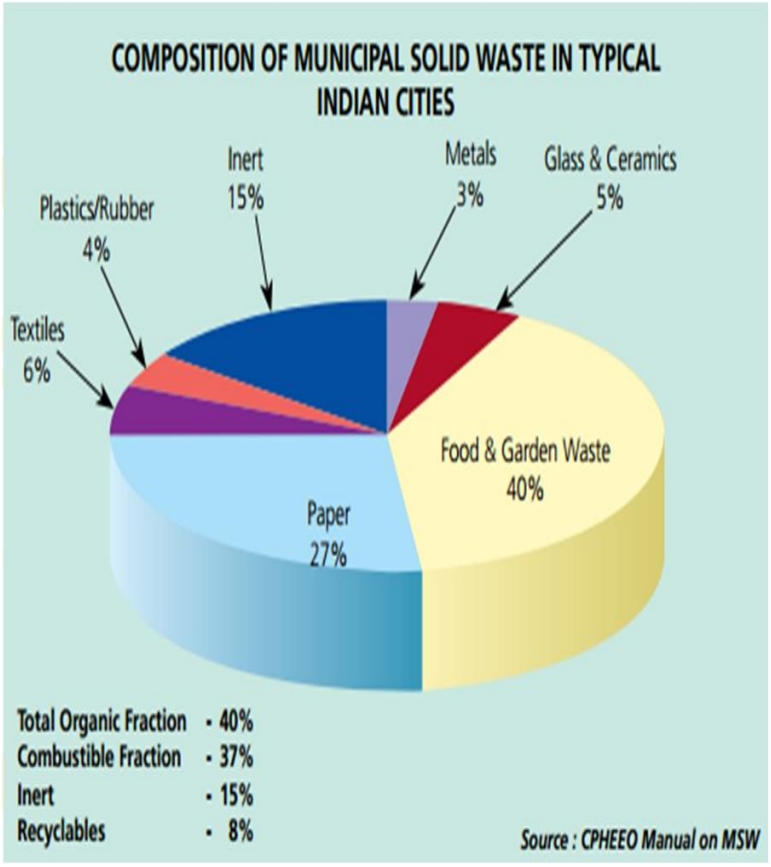

Fig. 1.2- Composition of MSW as per CPHEEO

SIDE EFFECT OF INTERACTION BETWEEN HUMAN, ENVIRONMENT AND SOLID WASTE

Solid waste disposed to the environment causes interaction to the environment and comes in the human lifecycle. Some of the solid waste contains harmful chemicals, metals and other degrading materials that have ill effect on the living being and the environment and causes deterioration of the environment.

Untreated solid waste can cause following problems:

i. Inhalation of harmful chemicals can cause serious issues.
ii. Chocking of drains can result in flood
iii. Lower weight of the infant's
iv. Congenital malformations
v. Neurological disease
vi. Nausea and vomiting
vii. Mercury toxicity from eating fish with high levels of mercury
viii. Plastic found in oceans ingested by birds

ix. Resulted in high algal population in river sand sea.

x. Degrades water and soil quality

CURRENT SOLID WASTE MANAGEMENT SYSTEM IN MORADABAD DISTRICT.

• Municipal cooperation is responsible for carrying out effective Solid Waste Management system in their Moradabad city area that would ensure prevention of diseases and control of pollution in that area.

• Use of biodegradable waste and composting of non- biodegradable waste is an important feature of my study.

• Currently A2Z private limited is associated with the municipal cooperation for collection and disposal of solid waste in the city area.

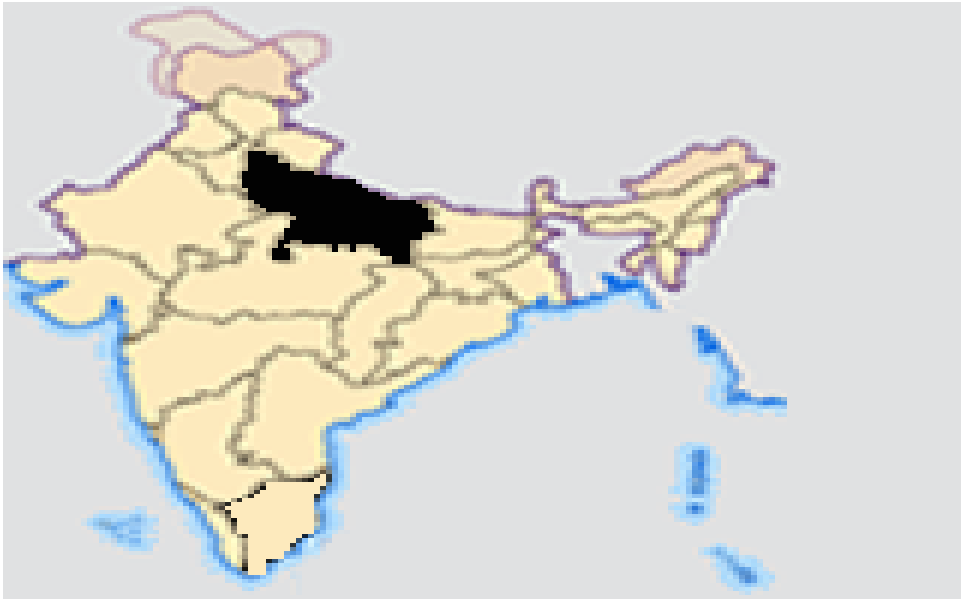

Fig. 1.6- Map of U.P. state of India

Fig. 1.7- Coordinates and indication of Moradabad city on map of U.P.

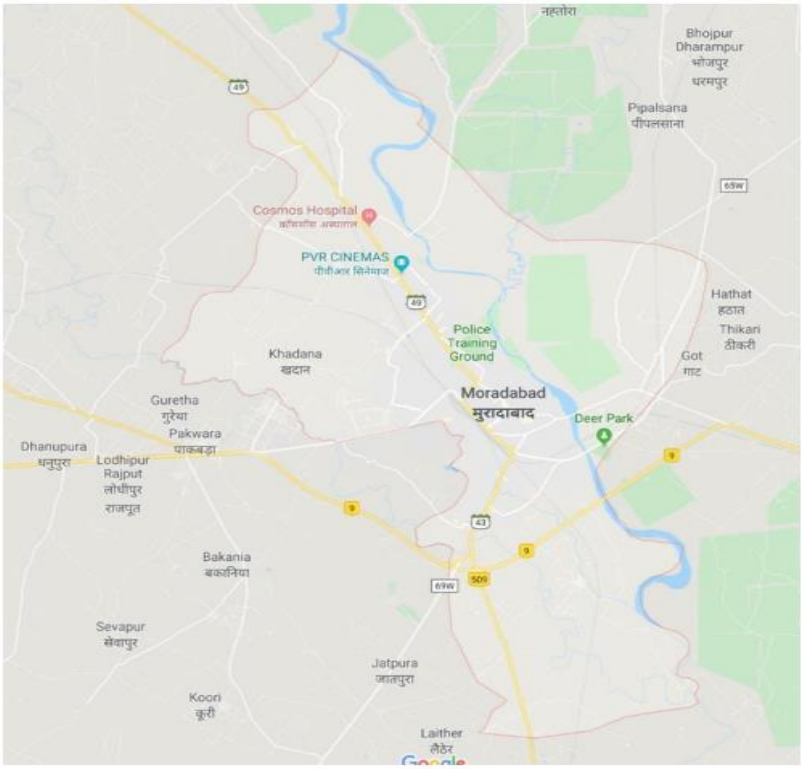

Fig. 1.8- Map of Moradabad District

General Literature Review

This part relates to the writing audit of numerous undertakings and looks into with respect to the impact of simulated totals against normal totals on the solid waste management plan for a small city or town. Various techniques and methods of waste management are reviewed and analysed to make the process cost effective, green-energy, continuous and eco-friendly as well as self-revenue generation method for rural as well as town area. These are following:

AHMED IMTIAZ et al. (1998) in [1]have done an evaluation based on technical, environmental, and economic factors indicated that reclaimed paving materials, coal fly ash, blast furnace slag, bottom ash, boiler slag, steel slag, and rubber tires have significant potential to replace conventional materials for various applications in highway construction and should be projected for future construction. Technical economic, and environmental problem associated with various applications of waste materials, identified under each waste material and briefly discussed must be addressed before extensive use of these waste products in highway construction.

Safiuddin Md. et al. (2010) in [2] In the analysis during different industrial, mining, agricultural and domestic activities, huge quantity of solid wastes are being generated as by-products, which pose major environmental problems as well as occupy a large area of lands for their storage/disposal. There is a tremendous scope for setting up secondary industries for recycling and using such huge quantity of solid wastes as minerals or resources in the production of construction materials. Environment-friendly, energy-efficient, and cost-effective alternative materials produced from solid wastes will show a good market potential to fulfill people's needs in rural and urban areas.

In order to maximize the use of alternative construction materials produced from different types of solid waste and to make the lab-based production processes feasible in real world, the technology-enabling centers are needed to facilitate entrepreneurs for effective commercialization. Good mechanical and durability performance of the newer products, dissemination of technologies emphasizing cost-benefit analysis, and feasibility assessment report

will significantly contribute to the successful commercialization of the innovative processes.

Cole C. et al. (2011) in [3]This paper was the part of an ongoing research project that aims to improve the efficiency and effectiveness of household waste collections. The UK has traditionally relied on disposal at landfill sites whilst the rest of Europe has used incineration. The environmental concerns regarding the use of landfill are well documented, as are concerns about the long-term impact of the high temperature residues from incineration. The move towards more sustainable approaches to household waste management, with waste increasingly seen as a resource, has seen widespread changes in kerbside collection methods to encourage separation of waste for recycling, reuse and bio-treatment.
This paper examined household waste management drivers, current practices and challenges within the United Kingdom (UK) context.

Christian Fischer (2012) in [4]Included his main objectives Based on historical MSW data for Germany and EU targets linked to MSW the analysis undertaken includes:

- The historical performance on MSW management based on a set of indicators;
- Uncertainties that might explain differences between the countries' performance which are more linked to differences of what the reporting includes than differences in management performance;
- Relation of the indicators to the most important initiatives taken to improve MSW management in the country; and
- Assessment of the future possible trends and achieving of the future EU targets on MSW by 2020.

AgarwalDivya et al. (2012) in [5] Municipal Solid Waste Management (MSWM) is a key concern for the developing countries to facilitate optimal utilization of natural resources. Most of the MSW is disposed unscientifically in India. Environmental pathways are being broken. Managing municipal solid waste is a problem of high significance and growing magnitude. Uncollected

MSW end up in drains, causing blockages, resulting in flooding and insanitary conditions (water-borne and water induced diseases).

A reliable data generation system of MSW of waste generation, collection &storage, transportation and treatment & disposal facilities of Indian cities is an important step towards sustainability. The main objective of the study was to gather relevant data and information regarding the primary and secondary collection, treatment and disposal of municipal solidwaste in Uttar Pradesh. A detailed study was conducted through the field trips and postal surveys in all the major cities of U.P.

The ultimate repository of a city's MSW management is well designed landfills which are in accordance with appropriate local health and environmental standards. Waste is deposited in 0.9-4.5m thick layers in depressions and then compacted and covered at least once a day by earth with bulldozers. State of the art landfills are expensive to operate as there are requirements concerning daily cover, liners, leachate collection, gas collection, monitoring, hazardous waste exclusion, closure and post closure requirements and financial assurances. Selecting the site, certain restrictions e.g. water supplies, endangered or threatened species, scenic rivers, recreation or preservation areas utility or transmission lines.

MoharanaPravash Chandra (2012) in [7] studied that the rural India has tremendous wealth in terms of underutilized crop residues, animal excretion and domestic refuge normally known as waste. A systematic management and utilization approach applying the recent innovations will only help in maintaining rural areas clean but will also provide sufficient energy, manure and raw material for many industries. The sustainable waste management technologies have brought about a positive change in the sanitation and hygiene behavioral changes in the rural people. But we have a long way to go before we can attain a level of maturity in the areas of waste management in the rural areas.

UpadhyayVipin et al. (2012) in [8] On the basis of their study more emphasis needs to be laid on segregation and collection of waste at door step. Segregation of recyclable material from mixed waste not only is Tedious but also wasteful,

therefore the residents should be sensitized towards the importance of segregation of wastes at source. Rather than considering the solid waste simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the techno-economic viability, local condition and sustainability of the project on long term basis.

A better management for recyclable and biodegradable waste utilization provides the facility to reduce the waste disposal up to 60-70 % of the total waste dispose at present.

Kumar Vijay et al. (2013) in [9] As per Municipal solid waste Management and Handling rules -2000, solid waste management is in the obligatory function of urban local bodies, but in actual practice the solid waste management is given the last priority and the duties are either not performed or poorly performed consequently the city has to face numerable problems related to environment and sanitation.

As per the reports of the committee constituted by the Hon'ble Supreme Court of India in March 99, the lack of financial resources, inefficient institutional arrangement, inappropriate technology, weak legislative measures and unawareness in public towards solid waste management has made the service most unsatisfactory and inefficient.

The solid waste management approach in India is extremely inefficient, using old and obsolete system, technology for storage collection processing, treatment and disposal. There is no formal organized system of segregation of biodegradable and non-biodegradable solid waste. The recovery and recycling of waste is only done by scavengers and scrap dealers which is highly hazardous to those which are involved in this job.

Kolisetty R.K. et al. (2013) in [10] analyzed that the problem of disposing these waste materials became a big environmental problem, the proper utilization of these materials again in construction activities will be a great relief to the society. Some of the important elements in this respect are the reduction of the consumption of energy and natural raw materials, systematic consumption and use of waste materials to a great extent. Research & Development activities have

been taken up even in India for proving its feasibility, economic viability and cost effectiveness for the use of waste materials in all the construction activities.

PamnaniArti et al. (2014) in [11] Municipal solid waste generated depends on population climate, urbanization, socioeconomic criteria etc. Overall MSWM practices adapted in India at present are inadequate. It is also noted that efforts are made to improve MSWM in major cities but due attention is not paid for MSWof medium and small-scale towns. The current regulations (MSWM rules, 2000) are very stringent.

Many deficiencies are identifying in the implementation of policy. Non compliances in MSWM are largely due to lack of training, financial constraints, lack of proper planning and leadership. For developing country like India having 71%, population residing in small-scale towns and villages proper waste management policy should implement in these areas. Optimization studies should be carried out to explore the feasibility of integrated waste management through clustering and their surrounding villages for better MSWM of smalltowns.

Mishra Brajesh et al. (2015) in [12] reviewed of various Industrial wastes for use in the construction of highway has been discussed above. The waste materials are fly ash, blast furnace slag, cement kiln dust phosphonyls, waste plastic bags, foundry sand, colliery sand and processed municipal solid waste (MSW) which are the industrial wastes posturing problems in the disposal and being deposited in the vicinity of industries in India. The following conclusions can be drawn from the study-

- Fly ash can be used in concrete admixtures to enhance the performance of concrete roads and bridges.
- Grouts are proportioned mixtures of fly ash, water, and other materials used to fill voids under a pavement system without raising the slabs or to raise and support concrete pavements.
- Blast furnace slag has been used as a cementitious binder in road construction.
- Just as foundry slag has been used as a substitute for native coarse aggregate in concrete mixtures, blast furnace slag has also been used in asphalt mixtures.

- Cement kiln dust can be used to replace a portion of the mineral filler used in hot-mixed asphalt.

So Rural roads should be constructed by adopting the Intermediate Technology.

- Low cost marginal and industrial waste may be promoted for rural road construction; necessary design and specifications be developed.
- The standard construction technology should be used for ensuring quality of construction.
- Many lower cost technologies like soil stabilization is not used often due to lack of appropriate mechanical devices; such shortcomings must be removed by appropriate developments for machineries.

M. Nelles et al. (2015) in [13] In this paper The new German Closed Cycle Management Act is aimed to turn the waste management into a resource management. Therealization that waste can be a useful source of raw materials and energy is not new; metals, glass, and textiles have been collected before and put to new use. The waste management policy, which has been adapted in Germany over the past 20 years, is based on closed cycles and assigns disposal responsibilities to manufacturers and distributors of products. This has made people even more aware of the necessity to separate waste, led to the introduction of new disposal technologies, and increased recycling capacities. Today, 14 per cent of the raw materials used by the German industry are recovered waste. Modern closed cycle management contributes, with a share of approximately 20 per cent, to achieve the German Kyoto targets on the reduction of climate-relevant emissions.

Samiha Dr. B. et al. (2015) in [14] In this paper study done on the practices as well as reducing and reusing habits into our everyday lives and our day-to-day activities so that it becomes a norm rather than an option. Local governments should make more incentives to increase 3R principle's participation by providing householders with financial incentives which can increase participation and recycling rates and by supporting the concept of people paying less is they recycle more.

The municipalities charge fees for waste collection but it doesn't charge for waste disposal. However, in reality disposal requires more technical expertise

and efforts. Therefore, applying disposal fees can encourage people to minimize waste generated. And government should develop laws to pay a tax for each of throwing waste in public places because this can create unpleasant odor and unattractive appearance of piles of uncollected solid waste along streets all those can discourage tourism.

We can help to realize a closed-loop for recycling if everyone brings the waste (e.g. paper, plastic, glass) to recycling centers. Then this waste will be sold to factories, where they use that waste to make new products and people will buy the new products and use then recycle them and the whole loop starts again. In addition, Reduce, reuse and recycle are also a form of patriotism, because we are helping our country to save money and reduce our dependence on other countries for raw materials. We should make use of items as much as possible and encourage the consumption of second hand products. Moreover, we should use more reusable products such as the reusable bags which made of cloth or jute, and reuse the plastic bags as possible. As well as, avoid purchasing heavily packaged products and minimize packaging to minimize the amount of waste or reuse packaging where possible.

Shah Priyank et al. (2015) in [15]Two decades of economic growth since 1990 has changed the composition of Indian wastes. The quantity of MSW generated in India is increasing rapidly due to increasing population and change in lifestyles. Land is scarce and public health and environmental resources are precious. The current SWM crisis in India should be approached holistically; while planning for long term solutions, focus on the solving the present problems should be maintained. In India especially in rural areas, waste is a severe threat to the public health concern and cleanliness. Though, the form of waste (both solid and liquid) generated in rural areas is predominantly organic and biodegradable yet becoming a major problem to the overall sustainability of the ecological balance.

OkeyinkaOriyomi M. et al. (2015) in [16] The literatures studied establish the possibility of utilizing solid waste materials like, plastic, wood, metal, paper, glass and demolished concrete as constituent of building materials. The use of these wastes at adequate level of replacement or proportions as the case may be, will

improve the intrinsic properties of the building materials concerned. The application of these construction materials in real construction is limited. More research is needed to study the actual behavior or performance of solid waste-based building materials in their practical applications because, properties like durability which has to do with long-term performance can be best studied through this means. In addition, the need to establish an energy efficient method for processing the solid waste to make them suitable for use in concrete standard mix design formulation is also required.

ShethJil et al. (2016) in [17] Based on their analysis it can be deduced that a radical paradigm shift is need of the hour to boost this waste management scenario in Ahmadabad, and to position its future as a contemporary, clean, enticing and live able city. Decentralization and segregation at source can be beneficial as compared to current cost of INR1000 per ton for solid waste management; cost can reduce to Rs. 418 per ton and also can lead to better standard of living of society. Out of 4000 MT generated daily only 800 MT would be needed to dispose daily which would lead to 80% volume reduction then current scenario. As only 800MT tones would be disposed, it would further lead to reduction in GHGs emission and thus would lower carbon footprint. Henceforth, adopting segregation at source can thus lead to cleaner and better environment. Thus, a sustainable, preventative and comprehensive approach towards waste is needed.

Joshi Rajkumar et al. (2016) in [18]The abysmal state of and challenges in municipal solid waste management (MSWM) in urban India is the motivation of the present study. Urbanization contributes enhanced municipal solid waste (MSW) generation and unscientific handling of MSW degrades the urban environment and causes health hazards. In this paper, an attempt is made to evaluate the major parameters of MSWM, in addition to a comprehensive review of MSW generation, its characterization, collection, and treatment options as practiced in India. The current status of MSWM in Indian states and important cities of India is also reported. The essential conditions for harnessing optimal benefits from the possibilities for public private partnership and challenges thereof and unnoticeable role of rag-pickers are also discussed. The study

concludes that installation of decentralized solid waste processing units in metropolitan cities/towns and development of formal recycling industry sector is the need of the hour in developing countries like India.

Rai V. K. et al. (2017) in [19] concluded that solid waste management in Varanasi city is in very bad shape. The present work reveals that municipal corporation is unable to meet the requirement of increasing population due to inadequate manpower and modern equipments. Proper disposal of bio-medical wastes from hospitals, diagnostic centers and pathological labs could not be takes place in the city. Such wastes not only cause threat to environment by contaminating the land, air, and water resources but also believed to cause intestinal, parasitic and skin diseases among sanitary workers engaged in collecting refuse .In the city Due to lack of adequate capacity to transport wastes and there are no sanitary landfills to dispose of the waste. The existing landfills are neither well equipped nor well managed. Also, they are failed to protect against contamination of soil and groundwater. At present most of the Municipal solid waste in the city is disposed of unscientifically. Waste treatment and disposal sites can create health hazards for the neighborhood. Improperly operated incineration plants cause air pollution and improperly managed and designed landfills attract all types of vectors, insects and rodents that spread diseases such as dysentery, diarrhea etc. which affects the health of human beings. To minimize the solid waste generation adopt the policy of 4R's. That is Refuse, Reuse, Recycle and Reduce. The current regulations (MSWM Rules, 2000) are very stringent.

NandanAbhishek et al. (2017) in [20] in this study it is concluded that despite the fact that Solid waste management practices has been improving in recent years, the pace of improvement needs to be accelerated. Measures mentioned in MSW rules must be implemented.

Time has come to encourage technology basedentrepreneurship to achieve effective solid waste management. NGOs should be involved in various components of waste management including public awareness. Public involvement in management of solid waste is of significant importance. Authorities must protect fundamental right of citizens by implementing best

practices and citizens must perform fundamental duties by their contribution to those practices.

AllamZaheer et al. (2018) in [21]This research undertook an exploratory case study of a potential solution to cater for plastic waste disposal and treatment, informal settlements management, and low-income job creation within the city of Cotonou, Benin. The theoretical framework proposed draws upon the socio-technical transition theory from a multi-level perspective (MLP) while the selected pathway of change resides within the hallmarks of a reconfiguration pathway. The discussion has demonstrated that by engaging actors at the niche level into waste sorting at the source, followed by subsequent collection and transformation into plastic-based construction bricks, that there is potential to help alleviate poverty, curb illegal disposal of waste, and discourage illegal settlement construction, shifting this community towards a more sustainable environment. Such an endeavor will promote livability within the city of Cotonou. However, there is also a need to understand all the dynamics of flow within the city of Cotonou to ensure viability and sustainability of this project.
This paper aims at showcasing that waste management in Benin can generate substantial revenue, and that there is a mutualisation potential in solving the housing crisis while tackling the waste problem. This approach can be replicated in other African countries experiencing the same issue. This paper offers encouragement for policy makers to adopt similar practices.

AhluwaliaIsher Judge et al. (2018) in [22] This study analyses the environmental and financial sustainability of solid waste management in Indian cities. It presents an assessment of the rapidly rising volume of municipal solid waste, its changing composition, the continuing practice of mixing biodegradable (wet) waste with dry waste at the source of generation, and the growing volume of plastic in the waste. The present system is focused on collection and transportation of largely mixed unsegregated waste. Resource recovery from the waste and safe disposal of the residual waste in scientifically designed landfills are grossly neglected. Rules have now been put in place for sustainable solid waste management, but the capacity to plan and manage the system and ensure the enforcement of the rules is a major challenge.

This study also presents the sources of greenhouse gas emissions from the solid waste sector. Besides presenting some mitigation choices to respond to the growing challenge, it also suggests mechanisms for ensuring that the system is financially sustainable.

FUTURE SCOPE

1. More objectives can be searched out to make advance waste management plans using this study in future.
2. Future technologies can make the project more easy, effective and environmental pollution free.
3. Since this project is sustainable and environmentally friendly so it will helpto reducethe problems related to environment & ecology.
4. Waste utilization can be done more efficiently in construction industry in future.
5. The project has also a great scope in agricultural field.
6. As this study has taken the reference to MSW rules 2016 so it may help as a reference for researchers to work out further in related fields in future.
7. Other similar MSW plans may be established in similar type of cities and as a reference for other types of cities.
8. Better Collection, Transportation and segregation techniques may be improvised in future over the existing technology at the source and plant both.

References

[1] AHMED IMTIAZ AND LOVELL C. W., "Use of Waste Materials in Highway Construction: State of the Practice and Evaluation of the Selected Waste Products", School of Civil Engineering, Purdue University, West Lafayette, Ind. 47907.

[2] Lau H.H., Whyte A. and Law P.L., "Composition and Characteristics of Construction Waste Generated by Residential Housing Project", Department of Civil & Construction Engineering, Curtin University of Technology (Sarawak

Campus), Sarawak, Malaysia, Int. J. Environ. Res., 2(3): 261-268, Summer 2008, ISSN: 1735-6865

[3] Safiuddin Md., JumaatMohdZamin, Salam M. A., Islam M. S. andHashim R., "Utilization of solid wastes in construction materials", International Journal of the Physical Sciences Vol. 5(13), pp. 1952-1963, 18 October, 2010, Available online at http://www.academicjournals.org/IJPS, ISSN 1992 - 1950 ©2010 Academic Journals

[4] Cole C., Osmani M., Quddus M.A., Wheatley A.D. and Kay K., "HOUSEHOLD WASTE MANAGEMENT IN THE UK: CURRENT PRACTICES AND CHALLENGES", Department of Civil and Building Engineering, Loughborough University, Loughborough, LE11 3TU, Charnwood Borough Council, Southfield Road, Loughborough, LE11 2TN, WASTES: Solutions, Treatments and Opportunities, 1St International Conference, September 12th – 14th 2011

[5] Christian Fischer, "Municipal waste management in Germany", February 2013, Copenhagen Resource Institute, http://www.cri.dk/

[6] AgarwalDivya, Gupta Anil Kumar and Agarwal Manoj Kumar, "Analysis of Solid Waste Management Strategies in Major, Cities of Uttar Pradesh in India" , Journal of Pure and Applied Science & Technology, Copyright © 2011 NLSS, Vol. 2(1), Jan 2012, pp. 66-74

[7] MoharanaPravash Chandra, "Rural Solid Waste Management: Issues and Action", National Bureau of Soil Survey and Land Use Planning, https://www.researchgate.net/publication/265413674

[8] UpadhyayVipin, Jethoo A.S, Poonia M. P, "Solid Waste Collection and Segregation: A Case Study of MNIT Campus, Jaipur", International Journal of Engineering and Innovative Technology (IJEIT) Volume 1, Issue 3, March 2012, ISSN: 2277-3754

[9] Kumar Vijay, DrPandit R.K., “Problems of Solid Waste Management in Indian Cities”, International Journal of Scientific and Research Publications, Volume 3, Issue 3, March 2013, ISSN 2250-3153

[10] Kolisetty R.K., Chore H.S., “Utilization of Waste Materials in Construction Activities: A Green Concept”, Department of Civil Engineering D.M.College of Engineering Sector-3, Airoli, Navi Mumbai-400708 (India), International Journal of Computer Applications (0975 – 8887), International conference on Green Computing and Technology, 2013.

[11] PamnaniArti, SrinivasaraoMeka, “MUNICIPAL SOLID WASTE MANAGEMENT IN INDIA: A REVIEW AND SOME NEW RESULTS”, Faculty of Technology: Dharmsinh Desai University; Nadiad; Gujarat; India- 387 001, ISSN 0976 – 6308 (Print), ISSN 0976 – 6316(Online) Volume 5, Issue 2, February (2014), pp. 01-08, © IAEME: www.iaeme.com/ijciet.asp Journal Impact Factor (2014): 3.7120 (Calculated by GISI)

[12] Mishra Brajesh, Mishra Ravi Shanker, “A Study on Use of Industrial Wastes in Rural Road Construction”, Assistant Engineer, U.P. Cane Development Department, Lucknow, India, IJIRSET.2015.0411009, ISSN(Online): 2319-8753, ISSN (Print): 2347-6710, Vol. 4, Issue 11, November 2015.

[13] Nelles M., Grünes J., Morscheck G., “Waste Management in Germany – Development to a Sustainable Circular Economy?” International Conference on Solid Waste Management, 5IconSWM 2015, 1878-0296 © 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

[14] Samiha Dr. Bouanini, Fatima Dr. Lalmi, “CHINA'S EXPERIENCE IN MUNICIPAL SOLID WASTE MANAGEMENT -LESSONS LEARNED FOR ALGERIA”, European Journal of Research and Reflection in Management Sciences Vol. 3 No. 3, 2015, ISSN 2056-5992

[15] Shah Priyank, Dr. Patel V.M., Patel Dhrumit And Patel Brijesh, “Solid and liquid Waste Management in Rural Areas”, Department of Civil Engineering

SVBIT, Gandhinagar, India , IJIRST –International Journal for Innovative Research in Science & Technology| Volume 1 | Issue 12 | May 2015, ISSN (online): 2349-6010

[16] OkeyinkaOriyomi M., Oloke David A., Khatib Jamal M., "A Review on Recycled Use of Solid Wastes in Building Materials", World Academy of Science, Engineering and Technology International Journal of Civil and Environmental Engineering, Vol:9, No:12, 2015

[17] ShethJilTushar, Patel Kinara, Prof. Shah Dipsha, "Solid Waste Management: A Case Study of Ahmedabad", IJSRD ||"Habitat Conclave 2016" Paper presentation on "Smart & Sustainable City"|| February 2016

[18] Joshi Rajkumar and Ahmed Sirajuddin, "Status and challenges of municipal solid wastemanagement in India: A review", ENVIRONMENTAL CHEMISTRY, POLLUTION & WASTE MANAGEMENT REVIEW ARTICLE, 2016 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

[19] RaiVineet Kumar, Kumar Pravin, Rai Praveen Kumar, "Problems of Sustainable Solid Waste Management in Urban Area: A Case Study of Varanasi City of India", Institute of Science, Banaras Hindu University, Varanasi-221005, U.P., India, Published in the Slovak Republic, European Geographical Studies, Has been issued since 2014, ISSN: 2312-0029, E-ISSN: 2413-7197, 2017, 4(2): 80-91, DOI: 10.13187/egs.2017.2.80

[20] NandanAbhishek, YadavBikarama Prasad, BaksiSoumyadeep, Bose Debajyoti, "Recent Scenario of Solid Waste Management in India", World Scientific News 66 (2017) 56-74, EISSN 2392-2192

[21] AllamZaheer, Jones David Sydney, "Towards a Circular Economy: A Case Study of Waste Conversion into Housing Units in Cotonou, Benin", Urban Sci. 2018, 2, 118; doi: 10.3390/urbansci2040118, www.mdpi.com/journal/urbansci

[22] AhluwaliaIsher Judge, Patel Utkarsh, “Solid Waste Management in India An Assessment of Resource Recovery and Environmental Impact”, INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS, 2018