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Solid Waste Management: A Case Study of Aurangabad, Maharashtra

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Abstract

Solid waste if not handled properly badly affects the environment. The waste has potential to pose threat to land air and soil. The poor solid waste management leads to social, economical, health and environmental problems. Aurangabad is famous for being tourist city of the Maharashtra state. The problems associated with solid waste management in the city of Aurangabad require immediate attention and action. At the surface the reasons for improper solid waste management include growing population and city. However these are only few of the causes. The paper presents the status of solid waste management and treatment practices in Aurangabad city. The paper throws light on the situation of solid waste generation source, handling, treatment and disposal. The article is concluded by offering suggestions to tackle the problem of solid waste.

Introduction

Modern and unorganized lifestyle is putting great pressure on natural resources. To cater the needs of human beings different products are made. The specialized products created by industries demand careful handling and after treatment. It is not only the product but the packaging which also needs attention. To create awareness amongst common man regarding the improper disposal of solid waste is a tough job.

Disposal of solid waste without proper treatment imposes negative effect on soil, water, air, human health and aesthetic value. [1] Uncollected wastes accumulate on the streets, public spaces, vacant lots, thus creating illegal open dumps. Residents can also simply throw their wastes at the nearest stream or burn them. [2] Present practices regarding solid waste include disposing waste in low lying areas, dumping in vacant place, storing waste in outskirts of city. There are many problems associated with solid waste. The waste is handled without taking any precautions.

In many case of solid waste management it is observed that there is public apathy and lack of co-ordination between different civic bodies. [3]

The main shortcomings are related to inadequate manpower, financial resources, implements, and machinery required for effectively carrying out various activities for municipal solid waste management [4]

Aurangabad was recognised as the fastest growing industrial city in Asia with industries spread over different parts. [5] Aurangabad city is one of the major industrial centre in central Maharashtra. The variety of Industrial centers located includes five star at Shendra, Chikalthana, Waluj, Pandharpur and Paithan MIDC area. These industries have provided growth opportunity.The Aurangabad Municipal Council (AMC) was established in 1936. It became a Municipal Corporation in 1982. As per last census 2011, the total population of the district was 11,77,330. The current population of Aurangabad urban agglomerate is over 15.5 Lakh.

The Ajanta and Ellora Caves, surrounding city are UNESCO World Heritage Sites. By population it is the 5th largest city in Maharashtra after Mumbai, Pune, Nagpur and Nashik. Aurangabad is located on the banks of the River Kham. The entire City is situated at the latitude of 19053'50''N and longitude of 750 22' 46'' E.[6] It has been observed that solid waste is major source of pollution. [7]

In a city of Aurangabad waste generation is around 40 TPD. The characteristic of waste depends on its type. With the increase in population of the city waste generation also increases.

The objective of this research article is to present the scenario of solid waste in city of Aurangabad. The problem of solid waste became severe in the month of February 2018. The situation badly affected well being of the people and environment. However in a city like Aurangabad there is no special mechanism for solving the problem of waste generated by house hold residences. The present article focuses on loopholes in the plan, preventive measures taken, and offering suggestions.

The main objectives of this work are as follows:

- To throw light on current solid waste management practices in Aurangabad
- To highlight the problems and challenges faced by authorities while tackling situation of solid waste management
- To offer suggestions to handle the situation of solid waste

Classification of Solid Waste

The solid waste generated from residences can be classified as bio-degradable and non-biodegradable depending upon its nature to undergo degradation process. In a broad sense the solid waste can also be categorized as dry and wet. As the Its broadly classified as solid, wet and biomedical waste. A typical solid waste collected from the city of Aurangabad shows presence of following materials: card boards, carry bags, pins, containers, glass bottles, tin containers, plastic items, leather, papers, rags etc. The size of waste in not only dominated by population but also by other factors like lifestyle type of locality, awareness about environment etc. Solid waste of each municipal corporation is diversified in nature.

The characteristics solid waste varies from different places. Factors like income level, the sources, the population, social behavior, climate, industrial production and the market for waste materials are influential. [8]

National Environmental Engineering Research Institute (NEERI) has carried out studies in more than 50 cities and towns in India. The Characterization of MSW showed that the waste consists of 30–45% organic matter, 6–10% recyclables, and the rest as inert matter. [4]

Solid Waste Rules

The rules cover major areas regarding segregation, disposal of sanitary waste, collect back scheme for packaging waste, user fees for collection, promoting use of compost, waste processing and treatment, promotion of waste to energy, revision of parameters and existing standards, management of waste in hilly areas, constitution of central monitoring committee. [9]

Problems Due To Improper Solid Waste Management

The most easy and popular solution of waste disposal is open dumping. The open dumping of solid waste is the most un-scientific method of disposal. It has been found that there are major problems of the open dumping practice. The chemicals leach out from the garbage and pollute the ground water and soil. The gases like carbon dioxide and methane, released from the site pollute the air.

These problems are classified as:

Environmental Problems

The impact of waste on environment also differs from different categories of waste. The waste which may appear harmless at its generation point could be dangerous as it comes in contact with environment. For example a kitchen waste, which include left over leaves vegetable fruits etc, appears harmless at its generation point. However once it enters the environment, it attracts flies insects and prove site for growing disease producing micro-organisms. Another example is of plastic which appears inert at initial stage. This plastic leads to choking of drainage, clogging of canals, ill health of animals. The plastic leaches out and releases different chemicals which severely affect the environment. Hence a strategy has to be adapted right from handling of solid wastes to its treatment.

Water samples were collected from the dug wells and bore wells, around the dumping site at Naregaon. The sampling was carried out in the mid of every season i.e. summer, Monsoon and winter for two years. It has found that the concentration of the metal ions is increasing with respect to the vicinity to the dumping site. The continued practice of waste dumping may result in further pollution of groundwater sources. [10]

Health

The organic waste present in garbage degrades and hosts several living organisms. Flies, insects, rodents etc get attracted to such site. The birds, cattle and dogs lead to further spreading of the waste. The colonies of living organisms further pollute the site. The wind and rain also act as agents to spread the

waste. The site gives offensive odours due to degradation of organic matter.

Social

The site of open dumping is always disliked for aesthetic reasons. The people surrounding the site face majority of health problems.

About 90% municipal solid waste is disposed of unscientifically and unmannered way in open dump places creating problems to public health and environment. Such an open dumping not only causes environmental problems but also distort the aesthetic beauty. [11]

Economical

The economic development of region gets restricted due to open dumping of solid waste.

Status of Solid waste management

In a city of Aurangabad, a village close to the vicinity was chosen as site for treating the waste. Since past 49 years the waste is being dumped in the area of this place called Naregaon. However with the passage of years the issues due to solid waste have become prominent. A site soon got converted into dumping ground. The height of a typical waste facility is that of two storey building. The waste attracted insects, mice, flies, rodents and dogs. Strife between locals and authorities made the authorities look for new land. A typical "not in my backyard approach" is making the situation difficult. The unscientific handling of wastes is not a welcome anywhere. Hence when a new site was chosen for dumping of solid waste it again caused the problem. The villagers refused to bring in vehicles loaded with garbage. This leads to think about other ways to treat solid waste.

Collection system

The role of AMC is most important for solving the problem of solid waste management.

The city is divided into 122 wards for waste collection and management. Near about 145 vehicles collect waste from different parts. Autos, tippers, trucks, Tractors, JCB, Loader etc are used for collection, transportation and handling of solid waste. Around 1545 members are looking after solid waste management. [6]

The garbage is segregated into two main categories as bio-degradable and non-biodegradable. The waste is collected from different wards thrice a week. The collection system appeared un-organized as there is no written document created as schedule by AMC. The bins are designated for storing bio degradable and non-biodegradable wastes. The practice was not used traditionally. However it came into force since 2017. The bins are not properly located and maintained. Community bin is a main practice for collection of garbage. Garbage bins are located in city but the number is inadequate. The bins are not emptied regularly. It is a common sight to find an overflowing bin.

Report preparation

The reports prepared by MPCB and ESR prove to be important documents in order to understand situation of city's solid waste management plan.

The ESR is a comprehensive document that serves as an input for new city/town Development Plans. The report identifies environmental concerns. The report presents details of environmental infrastructure and services like solid waste management. The ESRs are prepared since 2002. [12] The report highlights status of vermin composting, receiving station etc. [6,12] The MPCB report discusses several issues like finance management of MSW by local bodies, trained staff, community resistance, difficulties in identification of suitable land, selection of proper waste management technology etc. [13]

Awareness plan

Lack of awareness is a major problem. The implementation of training program is advocated to create awareness. Citizen's awareness about solid waste program helps to develop public campaigns. [14] However, Aurangabad Municipal Corporation with the help of Civic response team planned Bajaj Mazhi city Takatak Campaign which drew lot of community attention.

Budget

Sixty cores have been spent on solid waste management since last five years by AMC. The entire money comes from AMC.

Staff

For a city of Aurangabad, a typical team involved in solid waste management includes 1545 scavenger, self help group labour 327. For the sake of ease of operation there are 12 troop leader and 12 chief leaders. The waste pickers and scavengers are mainly responsible for collection of waste.

Vehicles

The AMC uses 120 loading riksha for collection of solid waste. The other vehicles used include tippers, hand held carts, bullock carts and trucks. The condition of vehicles is average to poor.

Treatment

The AMC does not have special system for treatment of solid waste. The waste is not treated before dumping. At the site there is no landfill or no lechate collection pipes. The waste is mixed in nature with presence of e-waste and bio-medical waste.

AMC New Plan

This includes searching a new site for disposal of solid waste. The Naregaon will no longer be used for dumping.The AMC's executive engineer on behalf of AMC invited expression of interest for setting up municipal solid waste processing plant having capacity 50 MT/ day. This will include generation of electricity, bio-gas and manure. [15] Aurangabad Municipal Corporation is planning for processing of the municipal solid waste. Segregation of mixed waste is an important step, for this AMC wants to install Screening machines. Each screening machine has got a capacity of 16 TPD. A typical layout of these machines involves their use along with shredder, bailing machine and conveyor belt. [16]

Challenges

Tourist

The city being a tourist destination attracts several tourists from all over the world. This again puts a pressure on municipal solid waste handling system.

Segregation and Treatment of Waste

The segregation of waste is carried out as wet and dry waste. However in several wards the idea is not taken seriously and waste occurs as mixed waste. The mixing of dry and wet waste makes the process complicated. Depending on characteristics of waste treatment should be decided.

Awareness Plan

Most of the residents are unaware of threats related to handling of wastes. Practices like burning of waste containing plastic waste are carried out without any care for the environment. The open dumping of waste in channels and gutters is another such deadly practice.

Workers and Staff

The number of workers and staff is limited. Generally the work related health problems of municipal solid waste workers in India are respiratory, dermatological, eye problems and injury. [17] There is no review of health of scavengers.

Suggestions

The problem of solid waste management demands careful planning and apt execution. Improper solid waste management poses impact on society and environment. The problem must be solved considering both these factors. The suggestions are offered keeping this scenario in view and considering important aspects like quantity of waste generation, type of waste generation, techniques available for the treatment of waste, equipments available for the treatment of wastes etc.

Technology

Depending on various factors like quantity of waste generation, nature of waste, terrain and climatic condition, land availability, social acceptance, environmental norms etc the method for waste management is to be selected. The quantity of waste generation plays vital role in selection of waste processing technologies.

In a study done on solid waste management researchers have found that Vermi-composting plants are capable of handling effectively up to 30 Tonne per day and aerobic composting plants up to 500 Tonne per day. The waste-to-Energy plants are found cost-effective for processing waste 500 Tonnes per day and above. [18]

Geological study

A geo hydrological study reveals important information regarding land slope, terrain etc.

A geo-–hydrological investigation of area to be used as solid waste dumping site must be carried out. [7]

Survey

Due to changing pattern of waste composition emphasize needs to be given on its segregation and management. A survey should be carried out on generation and characterization of solid waste. To obtain a statistically reliable sample large number of samples must be analyzed. [19] This data could be processed and conclusions could be derived.

Segregation

The characterization study of waste from waste disposal sites reveals that, pH, moisture content, organic matter, organic carbon and NPK were found in the moderate range. A typical waste comprises maximum portion of degradable material making it suitable for composting. The moisture content in city waste is significantly quite higher and the calorific value is much lower, which determines the viability of composting or anaerobic digestions rather than waste combustion. [19]

The segregation of waste must be carried out at the source of waste generation itself. Attention should be given to proper segregation of waste.

Public Private Partnership

A public private partnership model could help to solve the problem. With a strong support of firm and society the problem of solid waste could be easily handled. It is need of an hour to build partnership with national and international bodies.

Experts have suggested a community based solid waste management system which would involve recycling, composting and sanitary land filling. There is a need to take up a sustainable municipal solid waste management plan in Aurangabad city. [7]

Weather Effect on Solid Waste

The weather of Aurangabad city remains dry and moderately extreme. Temperature of Aurangabad city lies between 9 -41.8 ^{0}C. The relative humidity is in the range of 35-50%. The winter season commences from the middle of November and ends by the end of the January followed by a dry hot summer from February to middle of June. [6] It is important to consider the weather condition while selecting a method for the treatment of waste this should be considered.

Implementation of SWM Rules

Strict implementation of solid waste management rules should be observed. Integration of waste pickers and waste dealer in formal system should be done by government and self help group. [9]

Composting

Main requirement of composting is huge land. The composting should be carried out on organic waste. The waste must be prior treated before composting. Community compost at society, colony or apartment level is suggested. This can be practised by many user friendly techniques. In a research it was found that, aerobic composting of solid waste can be carried using a bacterial consortium. Studies have shown that the aerobic composting completes in 25 days. The obtained compost was stable and chemically balanced. [20]

Waste to Energy

Waste to energy is playing vital role for renewable energy production. It is observed that, due to low calorific value and high water content incineration of municipal solid waste is complex. [21]However incineration cannot be looked upon as an ideal practice for solving the problem of solid waste generated by households. Also,if the waste contains high moisture it becomes unsuitable for these techniques. Usually in municipal solid waste the organic material content is high hence the calorific value is low.

Sanitary Landfill

Instead of open dumping sanitary landfills must be practiced. The landfill site is a scientific way to dispose solid waste which cannot be degraded by micro-organisms. The landfill can be used as a recreational area. However it should be noted that, the recyclables in solid waste could have a different destination other than the disposal in sanitary landfills. [22] The guidelines issued by MPCB for processing and landfill site include several factors like: Site location, plan, presence of water bodies, Distance from habitation, capacity, quantity of waste generated etc. [13]

Equipments

The number of equipments useful for handling solid wastes must be procured. The equipments should be designed on a batch scale. Bulldozers are used for levelling the site. Compactors and bailing machine should also be brought for handling solid waste.

New ideas

New technologies and ventures should be embraced. Continuous efforts should be made to search best possible outcome.

A new solid waste management regulatory policy can result in business in social opportunities and demand. With any new policy such opportunities exist and needs to be identified. [24]

Awards

The areas following the rules and generating less quantity of solid wastes must be awarded in the form of amenities. This will serve dual purpose:

i) Less generation of waste

ii) Beautification of wards

Cell

A special team which has designed for solid waste management should arrange frequent meetings and follow up of serious issues must be taken.

Awareness

The citizens should be encouraged to reduce reuse and recycle the waste. Awareness regarding cleanliness must be created. School going children must be imbibed with the virtue of cleanliness. Recycled products must be welcomed. Trainings for officials and citizens must be held on a regular basis. There must be transparency regarding technology adopted for treating solid waste. All the stake holders should be kept informed regarding the developments. Mass Media should be looked upon as an important tool for creating awareness. Media such as television, radio, newspaper, billboards and relevant Inter-net sources or even door-to-door approach should be used to inform the public regarding solid waste management.

Recycling should be formally introduced in schools [25]

Fine or punishment

A fine should be imposed on persons or agencies littering the city. Due fine must be charged for improper handling of solid waste as per the law.

However, cities should not punish residents for throwing wastes on the roads if cities cannot regularly and properly clean all garbage points themselves. [2]

Health of Waste Pickers and Scavengers

Globally waste pickers help to conserve natural resources and energy. They also help to reduce greenhouse gas emissions through the reuse of materials. [26-28]

Waste pickers are usually estimated at 1% of the Indian population. There are an estimated 15 lakh waste pickers in India. Maharashtra state has more than 3 lakh waste pickers. [27]

Measures such as availability protective gears based on ergonomic principles, clean drinking water and washing and sanitation facilities during working hours are needed to improve the work environment of waste handlers by ensuring [17]

Many of people depend on waste management sector for their livelihood. It is necessary to improve their working condition, earning and social status. This informal and unorganised sector must be integrated in order to support them. [1]

Conclusion

The problem of solid waste will grow rapidly if not given due attention. The waste which appears harmless at its source could prove to be a major problem if not treated well. The efforts taken by municipal authorities regarding solid waste handling and treatment need to improve. With the aid of technological intervention in the treatment process the scenario of solid waste handling and treatment practices can be altered. The solid waste management laws are meant to protect the environment. A vigilant eye should be kept on their implementation. It seems that though the generation of solid waste cannot be controlled. However enough measures should be practiced for its disposal and treatment. There are lessons to be learned from the past. The future of solid waste management practices can surely alter future and development of Aurangabad.

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