SUSTAINABLE SOLID WASTEMANAGEMENT AND VERTICAL GROWTH IN TOWER IN URBAN AREA

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Abstract: In this era of rapid urbanization and limited land, growth is running vertically in the sky touching towers. Creating space in the form of apartments for families and looking after the basic amenities is the need to sustain the rising population. Solid waste is an important issue in this rising population. Collection, transportation, treatment,recycling,reusing and up cycling of solid waste is a concern for all stakeholders including builders, residents, garbage collectors, garbage contractors, government officials besides our natural flora and fauna. Development is the demand however Sustainable Development is the concern. Present solid waste management programs should not only sustain the vertical growth but also be equipped enough to harness the huge amount of by-products generated through structured solid waste management. Innovative, economical and sustainable processing of solid waste and using its by-products is required. Here it has been tried to highlight why solid waste is a menace and how this menace can be effectively managed through various modern technologies like clean energy production from biomass, installation of the heat recovery system, reuse and recycle plastic waste, units for conversion of bio waste into an up cycled sustainable bio-based material substitute and Carbon up cycling technologies (CUT).

Keywords: *Bio waste; Carbon up cycling technologies; Influential factors sustainable development; Solid waste management; Vertical growth.*

1. INTRODUCTION

Rapid concretization and extensive vertical population rise of the Delhi NCR area are mind boggling concerns in sustainable development. Solid waste management and vertical growth of the city are not sinking together with an idea of sustainable development. Unsustainable population in high rise towers is contributing to massive accumulation of garbage around the city and water bodies which are running parallel to Delhi, Noida, Greater Noida, Ghaziabad, Faridabad, Greater Faridabad area.[1] A large area is being cleared to raise the concrete forest. Builders construct high rise buildings with unconcerned planning or partial estimation of waste generated and their management at source and sink. The vertical population that is taking over these towers is unaware of the lethal concern on the environment to be followed by their occupancy in these apartments. The situation is already alarming. There is a need for a structured scheme of waste disposal and its proper execution. Awareness about the problem is also equally important. This should no longer be limited to handful of aware environmental enthusiast but should be seeded in mind of present society,one and all stakeholders. [2]

2. SOLID WASTE A MENACE

The city is growing vertically as we talk of long towers however waste management is not even enough for horizontal expansion. We can easily trace trails of exposed solid waste as we pass through lanes and boundaries of habitation in and around Delhi NCR region. Municipal Corporations needs to be equipped to handle and effectively manage the large quantum of waste generated per day in vertically growing cities. The evident proof of improper waste management is untreated waste is seen openly dumped**.** [3]

The sources of wastes are from residential, commercial, institutional, municipal corporation services. If we talk about residences it ranges from independent houses to flats, apartments, farm houses. Commercial includes from departmental stores, hotels, large supermarkets, malls, offices. The institutional waste is from schools, colleges, hospitals, government establishments and municipal corporation services generate waste when the streets, public areas are cleaned up. [4]

What kind of perishable and non-perishable materials are generated? It comprises from food waste, paper, cardboard, plastic, clothes, metal, glass, wood, electronics, special wastes, bulky items, leaves, hazardous wastes, construction debris and other discarded materials.

It is the onus responsibility of all the Municipal Corporation to manage Municipal Solid Waste, which is the by-product of modern lifestyle but the fact is that it is outgrowing urbanization. The data is very startling. A decade ago, it was recorded; 2.9 billion urban occupants generated about 0.64kg of MSW per person daily. Now, the latest record shows, 3 billion people are generating 1.2 kg per person every single day. It is estimated that, by 2025, it will be increased to 4.3 billion residents generating 1.42 kg of Municipal Solid Waste. [5]

To obtain quantitative information and to conduct analysis, two major scientific journals, Waste Management Journal and waste Management and Research took the initiative. The main objective of this research was to understand the stakeholders' action or behaviour which play a significant role in the waste management process and understand various other factors which are the influential factors. It was accounted from 22 developing countries in 4 continents. The source was collected from scientific literature, available data bases, objective observations made during the site visits, formal interviews with the people concerned, through participants of workshops and questionnaire shared with stakeholders. The information gathered from all these sources gave a strong valid base to understand the real reason for the systems' failure and it helped in planning, changing the system which was prevalent in these cities. MSW is improper which leads to various health hazards to the inhabitants. According to a study conducted, about 90% of MSW is disposed unscientifically in the open areas and landfills. [6]

3. SOLID WASTE MANAGEMENT IN ASIAN COUNTRIES

Method of collecting the Waste: In urban areas a systematic method is employed to collect the wastes. In developed countries, people are supposed to deposit the waste in fixed stations. They are expected to deposit the waste on a particular day of the week at a specific time at the locations meant for it. It has been experienced the citizens take it as their primary concern to fulfil this obligation. Their understanding and cooperation are all time high. Hence, the city looks neat and clean throughout the year. As an alternative, in developing countries, the vehicle from the Municipal Corporation goes door to door collection of the waste at a particular time. Still a lot of awareness and public participation are not very satisfactory.

To sustain life on earth, Solid Waste Management should be an integral part of human developmental process. The 3 R are the need of the hour globally and orientation to the unknown is frequently done. Further, to what extent a country is adopting and following it is a big question. "Zero Waste and Zero Landfilling involve a huge capital along with technological advancement. Due to the high level of cost involvement, countries with weaker economies will not be able to adopt to its full extant. Ashok V.Shekdar, in his paper presented an analysis on the trend in different Asian countries and also dwells into the future trends. He has also thrown light on integrated approach for the improvement to achieve sustainability in the context of national policy and legal frameworks, institutional arrangement, developed technology, operational and financial management and creating public awareness and participation. [7]

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4. METHODS OF DISPOSAL OF SOLID WASTE

4.1 Composting

The best and the most effective method of organic solid waste disposal is by composting. Each house can take this preventive measure to reduce the burden on the municipal corporation. It is also cost effective and can also be used as manure to the garden. [8]

4.2 Landfilling

There are two types of land filling namely sanitary Landfilling and open land filling.

Sanitary landfillingis adopted in developed countries. The landfilling is done away from the inhabitant areas and it is done in the most scientific manner which involves financial and technological aspects.

The other methods commonly employed in developing countries are open land filling which puts the citizens at health risk. This open dumping system is not a solution but just a temporary arrangement to dispose the solid waste. [9]

5. SEGREGATION IN DEVELOPED COUNTRIES OF ASIA

Japan is attributed to have the best MSW. The involvement of technology with human understanding to develop a healthier life eco system was the main target in the last half century. In 1970s, their focus was on energy recovery. In 1990s, recycling was made mandatory. In 2000, waste management was the priority to promote a recycling society system. Within a short span of time, it became a national drive. The system works out well in Japan, because they adhere to the mandates and participation rate is almost 100 percent.

In South Korea, through volume-based waste fee system, they were able to reduce the waste generation drastically from 1.3 to 1.04kg/cap/day in 1995 (Hong.1999) The recycled percentage increased from 26.2% to 44.0% whereas waste landfill decreased from 68.3% to 41.5% . [10]

Hong Kong generated 6 million tons of solid waste in 2005. 67% was done through land filling but now the story is taken over by thermal treatment (Poon, 2006).

The Municipal Corporations limitation in terms of technological advancement in types of equipment, Database manpower and adequate funds to tackle the menace should be taken care of. It should just not be an act of blaming and defending. The concern should be unanimous and real. No growth is sustainable if it is harming the Environment. Growth at the cost of ecological imbalance will certainly be a debt in a long run.

At present, the most common method employed by Municipal Corporations for disposal of solid waste is dumping of the collected waste at open dumpsites. These dumpsites are far from being called dumpsite as lots of measures are missing in these sites. Ghazipur, Okhla and Bhalswa landfills are mere mountains of garbage. Stretch of Aravalli's is used as dumpsites for Faridabad and Gurugram solid waste. Banks of canal and Yamuna rivers are also soaking in a lot of garbage in the city. Dumpsites waste consists of rich organic content. Anaerobic digestion of this waste produces gas rich in methane (40-50%) and carbon dioxide. This process is exothermic, and heat generated in it needs to be harnessed.

Recommended Sustainable Solution for Solid Waste from "Source" To "Sink"

Need for alternate programs for solid waste management: Solid waste management is a serious concern. Usually, there is no separation and no controlled collection, this affects waste management programs. Vision and prioritization of structured solid waste management from "source" to "sink" is required. Reduction of solid waste is no doubt the best management of solid waste however till the sufficient level of reduction is achieved we have to think on the ways and means of alternate solution to solid waste management.

Safeguarding waterbodies: Harmful components of Solid waste in landfills may infilter and reach to groundwater causing lethal effect. Sometimes untreated solid waste is released intowaterbodies making water bodies acidic, this adversely affect aquatic life forms and also terrestrial life forms which are dependent on these water bodies. Existing wastewater treatment plant should be functional, and research should be undertaken to modify the plants with the type of waste so that problem could be mitigated.

Harnessing carbon dioxide and methane: In this era of globalization and urbanization with many industries growing, it is difficult to reduce carbon dioxide emissions. The effort, therefore, must be laid to harness and use carbon dioxide.

Awareness program for builders and residents of towers: Sustainable development is an important issue. Each person must be aware of the danger of improper waste management. All the stakeholders like garbage collectors and garbage contractors, residents, builders and government officials must be sensitized on proper waste management. Reduction of waste should be ensured by issuing proper guidelines to the residents for reduction of waste. Segregation of waste as dry, wet,plastic,metals etc. should be done at the source itself.

Clean energy production from biomass: An effort is needed in production harnessing and utilization of biofuels generated from solid waste biomass degradation process.
Installation of the heat recovery system: Undesirable heat that is produced during solid waste disposal if recovered can be useful in several ways. New equipment should be designed which favours sustainability.
Concern over plastic waste: Single-use plastic management is important in contrast to banning. Start-ups that are thinking in line with reuse and recycle plastic waste should be encouraged. They may help in sustainable solid waste management.
Upcycling of waste plastic and ways and means to manage single-use plastic need to be worked upon: Conversion of bio-waste into an upcycled sustainable bio-based material substitute: Value of capital assets on all food waste like from banana peels, chicken bones or dirty plastics or packaging. It reduces residual household waste into its basic natural components that reconstitute themselves and bind together to form a new homogeneous composite with thermoplastic properties.
Carbon Upcycling Technologies (CUT): Carbon Upcycling Technologies ("CUT") is used to convert gaseous carbon dioxide to solid products. Carbon dioxide is used to make solid carbon nanoparticles. These particles can be used to make polymers. There are numerous innovative technologies which work to use these polymers to make concrete, there need of closed loop system where carbon dioxide should becollected stored, reused and upscaled. Whole world is thinking in this direction and India need to walk hand in hand with global change.

6. CONCLUSION

Development is the need of the population. The land is a limited resource for the population. At present hierarchy of waste management, treatment and disposal is most preferred. However, the trend should shiftto source reduction and reuse followed by recovering and upcycling of solid waste. Vertical growth is a solution to the limited land resource. So, proper solution to Solid waste generated from a huge population should be managed too. Estimation and managing of solid waste in the urban area is needed. Rapid urbanization should go parallel to sustainable growth. Systematic structured Solid Waste management is the demand for maintaining vertical growth and ecological balance.

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