INTRODUCTION

Any sort of item discarded by the public considered ‘waste’ or ‘garbage’, municipality collects and disposes off it at the municipal waste disposal site. The various types of waste include institutional, residential, industrial, commercial, and construction waste (Hoornweg et al., 2015). The waste management for municipal waste is deliberated as a public service, providing citizens with a structure and system for disposing of their waste in an environmentally and economically feasible way.

Everyday human activities are the major source of waste on our planet. Waste can be categorized into solid, liquid, and gaseous wastes depending upon its chemical nature. Solid waste mainly includes unwanted substances from industries, agricultural fields, hospitals, and pathological laboratories. Liquid waste is produced from the washing, flushing, and manufacturing processes of industries. Automobile factories and the burning of fossil fuels produce hazardous gases in the atmosphere and cause smog and acid rain.

Largely, there are three significant sources of Municipal Solid Waste (MSW): Household, hospitals and industries. Household waste which comes from the domestic area and can be classified into different groups such as hazardous waste, non-hazardous waste. It can also be biodegradable and non-biodegradable. Domestic waste mainly consists biodegradable components which are rotten vegetables & fruits and their peels, packaging cardboards, paper waster, dry grasses & leaves. Non-biodegradable plastic packaging waste and polyethylene bags are available in the highest amount and other non-biodegradable elements are metal and glass waste.

The waste generated in the diagnosis, treatment or immunization of humans or animals and during the research in a hospital is labelled as hospital or bio-medical waste. Bio-medical waste consists of both hazardous waste and non-hazardous waste. Normally this waste includes pathological, infectious waste, sharps, chemicals, geno-toxic and radioactive wastes. Non-hazardous waste includes garbage and daily waste produced by food and the packaging waste (Amin R et al., 2013). Typically, bio-medical waste consists 80% of the non-risk waste, and remaining 20% of the waste is either infectious or radioactive or chemical waste which falls into the hazardous waste.

Rapid economic growth and industrial development has resulted in increased amount of complex and hazardous industrial wastes. Any kind of material that is rendered useless during a manufacturing process in factories, mills, and mining operations is identified as industrial waste (Lei et al., 2015). The composition of the generated waste depends on the type of industrial processing activities. Based on studies, paper, metals, organic waste and cardboard are the main components in industrial wastes. Earlier, industrial wastes generators disposed the wastes into neighboring ecosystem without any treatment. In today’s time, factories and other industries are legally responsible for managing their waste in an appropriate and standard methodology of waste disposal (Thandavamoorthy, 2016).

Literature survey reveals that a large number of studies have been conducted on the solid waste management practiced in the different parts of the country. The studies are concluded with a few fruitful suggestions, which may be beneficial to encourage the competent authorities/ researchers to work towards further improvement of the present system. In (2007) Sharholy and Ahmad gives a review report over Municipal solid waste management in Indian cities. In his report they discuss about the qualitative and quantitative analysis, characteristics and composition, storage and collection, Transfer and transport, disposals and treatment of Municipal Solid Waste. Previous research surveys depicts that the disposal practices of collected waste is poorly managed in the world. It is very common to dispose the collected waste outside of the urban areas especially in the low lands, open government lands, abandoned canals and rivers or besides the highways.

Sustainability of urban Solid Waste Management is the main challenge nowadays. Talking sustainability to mean: being intellectual for the people, the planet and the profit sector in an integrated way. Waste management strategies can be planned on the basis of composition and the quantity of solid waste generated in a particular community. In urban areas, waste management is often a responsibility of the municipality, and there are regular waste collection and disposal systems in place. In contrast, in rural areas, waste management is often poorly managed at the village level, and there may not be any formal waste collection or disposal systems (Sahu and Mishra, 2022).

Vikash and Shreekrishnan (2008) evaluated the present state of municipal solid waste management in Delhi as it is the most populated and urbanized city in India. Delhi is also a commercial hub, providing employment opportunities and accelerating the pace of urbanization, resulting in a corresponding increase in municipal solid waste (MSW) generation. Only 9% of the collected MSW is treated through composting, the only treatment option, and rest is disposed in uncontrolled open landfills at the outskirts of the city. The proposed policies and initiatives of the Government of Delhi and the Municipal Corporation of Delhi to improve the existing MSW management system has been summarized in their work.

Dimpal (2012) presents a report on Urbanization and solid waste management in India. In the report, the author described how the urbanization high rate of population growth, declining opportunities in rural areas and shift from stagnant and low paying agriculture sector to more paying urban occupations, largely contribute to urbanization. The unexpected immigration has also caused the burgeoning of slums and the growth of squatters and informal housing all around the rapidly expanding cities of the developing world. Urbanization directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environment degradation.

Hazra and Goel (2009) gives an overview of current solid waste management (SWM) practices in Kolkata, India and associated problems. In the paper it has been revealed that more than 2920 ton/d of solid waste is generated in the Kolkata Municipal Corporation (KMC) area and the budget allocation for 2007–2008 was Rs. 1590 million (US$40 million), which amounts to Rs. 265/cap-y (US$6.7/cap-d) on SWM. This expenditure is insufficient to provide adequate SWM services. Major deficiencies were found in all elements of SWM. Despite 70% of the SWM budget being allocated for collection, collection efficiency is around 60–70% for the registered residents and less than 20% for unregistered residents (slum dwellers).

The collection process is deficient in terms of manpower and vehicle availability. Bin capacity provided is adequate but locations were found to be inappropriate, thus contributing to the inefficiency of the system. At this time, no treatment is provided to the waste and waste is dumped on open land at Dhapa after collection. According to them lack of suitable facilities (equipment and infrastructure) and underestimates of waste generation rates, inadequate management and technical skills, improper bin collection, and route planning are responsible for poor collection and transportation of municipal solid wastes.

Kumar and Goel analyzed Municipal solid waste (MSW) management practices in Kharagpur, a small city in West Bengal and propose integrated solid waste management plan. Narayan gives a comparative report on Landfills, Incineration, and Composting practices in India from Municipal solid waste management - From waste disposal to recovery of resources. Keeping in mind the costs that would be incurred by the respective governments, and identify the most economical and best option possible to combat the waste disposal problem.

Seema (2010) has focused on the clean development mechanism (CDM) projects involving energy recovery from municipal solid waste (MSW). In her work comprising of Municipal problems, regulatory framework in place and the clean development mechanism CDM opportunities in India, she also explains RDF (Refuse derived fuel- a fuel produced from various types of wastes such as Municipal Solid wastes), composting and landfill gas recovery methods. Comparative case study is also taken in consideration between Brazil and India and the study revealed that the India does not have well designed sanitary landfills where methane can be captured. India needs to make conscious effort towards developing more scientific landfills, capture methane and take carbon credits.

The status of solid waste in the city of Vadodara in Gujarat has been discussed by Komal and Himani (2014). They have also put forward their observations on the collection, transportation and management of the solid waste generated and also have suggested recommendations to improve the solid waste management. Suggestions put forward by them are as follows:

- Municipal solid waste should be segregated at source.

- ❖ Firing of municipal solid waste by the rag pickers should strictly restricted it will help to make environment free from toxic emission coming out as a result of burning of solid waste. It will also help to save exposure of human life to the toxic fumes.
- ❖ Collection of domestic waste should be in two bags/bins. One biodegradable organic and other few for inert recyclable waste.
- ❖ The Safaiwala should implement doorstep collection of waste at schedule time on daily basis. Bin should be installed on the roadside / parks also in the inside roads of the colony so that waste through on the road / street can be stopped. A scheme had been initiated by NDMC for door-to door collection of garbage and supplied polythene bags of 90" x 25" capacity at the subsidized rate of Rs.15/- per house/month in May 1994. Same scheme may be initiated by the VMC for the collection of domestic waste from door to door by the Safaiwala.
- ❖ Solid waste should be transported from the primary collection point to final disposal site in covered transport vehicle. It may help to check the public nuisance during transportation of garbage.
- ❖ Landfill site should be developing scientifically, so that percolation of leachate may be stopped.
- ❖ There should be regular monitoring of ground water and air to maintain the national quality of both as per the standard laid down in the notified guidelines.

It has also been suggested by them that in order to meet out the problem of municipal solid waste generated, the Ministry of Environment and Forests has notified the guidelines for the Municipal Solid Waste Management and Handling Rules 2000. These rules should be strictly implemented by the Vadodara Municipal Corporation.

Solid Waste Management which is already a mammoth task in India is going to be more complicated with the increase in urbanization, changing life styles and increase in consumerism. Financial constraints, institutional weaknesses, improper choice of technology and public apathy towards Municipal Solid Waste (MSW) have made this situation worse.

Poor collection and inadequate transportation are responsible for the accumulation of Municipal solid waste (MSW) at every nook and corner. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated daily in metropolitan cities. Unscientific disposal causes an adverse impact on all components of the environment and human health. So one of the biggest challenges in front of the modern society is the proper handling and management of the solid waste being produced indiscriminately.

The projected cumulative land requirement for India to dispose MSW in 2047 would be about 1,400 km^2 against the present land requirement of 100 km^2. In this scenario, it is important to look for alternative technologies which could be utilized for easy and faster management of the solid waste in the available space. The Non-biodegradable fraction of solid wastes could be sent for recycling while the biodegradable fraction could be converted into useful organic manures or compost or recovery of wastes in the form of energy could be done through incineration or by conversion into refused derived fuel - RDFs or by palletization. Some of the technologies already in use for conversion into composts are aerobic and anaerobic composting, vermicomposting, windrow composting etc. But all these processes take about 90 -360 days to yield results. So, faster technologies are required to be adopted having better organic values for compost than those utilized presently.

Environmentalists have several times mentioned the issue related to waste pilling up in landfills affecting the ecosystem. Quite a few types of cancer have been reported in people living near landfills where landfill gas migrates through the soil (Montague, 1998). MSW includes waste generated in households within a community under a municipality and waste generated from industrial or commercial sectors.

Landfill risks include leaching, the leachate is produced from biodegradable constituents of MSW through decomposition (Jones et al., 2006; Qasim and Chiang, 1994). The leachate release is an extremely damaging chemical containing dissolved and suspended toxic substances and metals (Jones et al., 2006). Heavy metals are considered to be lethal pollutants in the natural ecosystems, when their concentration reaches or exceeds a certain threshold in food, water, soil and air. These elements generally originate from different sources such as; industrial units, urban runoff, and landfills (Censi et al., 2006).

The picture of municipal solid waste (MSW) is complicated that includes several materials such as paper, plastics, food waste, metals, and glass with different physical and chemical characteristics. The chemical association of various materials varies from element to element, and the MSW composition varies with time, season, and geographic region (Pedersen et al., 2009). The compositional analysis of municipal solid waste shows that recyclable content in solid wastes varies from 13-25% and compostable material is about 80-85%. The compostable waste mainly comes from the kitchen i.e., food waste. Previous studies reports that household wastes are usually generated from variable sources where different human activities are involved.

In this advanced world polymers are immensely significant; being a key component in most parts of urban life, for example, garments, bundling, transportation, and correspondence. Polymers are atoms made up of countless small monomers. All kinds of plastics have immensely been used during past decade in all production sectors resulting into serious problems due to its accumulation in the environment (Sowmya et al., 2015).

Plastics are estimated to be 20% municipal solid waste (MSW) in United States and Germany (Leja and Lewandowicz 2010), 7.5% of MSW in Western Europe and 25% in Australia. In Turkey, 11 million tons of plastic were disposed per year (Orhan et al. 2004). In the year 1999-2000, India imported more than 120,000 tons of plastic (Tiwari et al. 2009). Annually, India generates 5.6 million metric tonnes of plastic waste with Delhi accounting for a shocking 689.5 metric tonnes per day. According to Central Pollution Control Board (CPCB) of India, total plastic waste which is collected and recycled in the country is likely to be 9,205 tonnes per day (approximately 60% of total plastic waste) and 6,137 tonnes remain uncollected and littered. Major offender in generating such waste are four metros with Delhi contributing 689.5 tonnes a day, followed by Chennai (429.4 tonnes), Kolkata (425.7 tonnes) and Mumbai (408.3 tonnes). The figures only serve to confirm the common areas of masses of plastic in industrial, residential and slum areas of Indian cities and towns (CPCB Annual report 2011-12). The efficient decomposition of plastic bags takes about 1000 years (Pramila and Vijaya Ramesh 2011; Usha et al. 2011). Recent published Central Pollution Control Board (CPCB) of India and Federation of Indian Chambers of Commerce and Industry (FICCI) reports state that plastic contributes to 8% of the total solid waste and annually 35 lac tonnes of polybags have been thrown into the oceans and major contributors of plastic waste are Plastic shopping bags (Polybags) & sing-used plastic products (disposable utensils).

Polyethylene is the most widely used plastic on the planet, being made into products ranging from transparent food wrap and shopping bags to packaging bottles and automobile fuel tanks. It can also be modified into synthetic fibers to take on the elastic properties of a rubber. Due to its high molecular weight, complex three-dimensional structure, and hydrophobic nature, among all plastics polyethylene has been proven to be inert plastic product. It can be categorized into high-density, low-density, and linear-low density polyethylene (HDPE, LDPE & LLDPE). Properties of LDPE reveal it to be tough, flexible & resistant to chemicals, whereas HDPE is more rigid & harder, but with a greater tensile strength than LDPE (Satlewal et al., 2008). LLDPE material has higher tensile strength and puncture resistance than LDPE.

Central Pollution Control Board (CPCB) report-2019 states that every day 25,940 tonnes of plastic waste is generated in India, out of which 94% is recyclable materials such as polyethylene terephthalate (PET), and polyvinyl chloride (PVC). However, these materials can be recycled utmost 7-9 times, after which they have to be discarded. A previous study on MSW Management has brought attention to non- biodegradable plastics i.e., polyethylene bags and food wrap- pers. Recyclable waste like PET bottles & other packaging wastes get segregated for recycling processes but only enduring plastic waste should be scientifically managed (Mewada et al., 2020).

Plastics such as PP, PS, and LDPE are only partially recyclable in India, due to the economic unviability of their recycling processes (CSE, 2020). However, recycling low-density polyethylene (LDPE) is difficult because of stress failure (Shankar et al., 2022). According to a recent news article, India produces 3.4 million tonnes of plastic waste, but only 30% of this is currently being recycled (PTI, 2023).

Plastic causes pollution and global warming not only because of increase in the problem of waste disposal and land filling but also because of the release CO2 and dioxins due to burning (Ali et al. 2009). The burning of waste plastic material produces toxic gases posing health hazard by causing lung diseases and cancer after inhalation (Pramila and Vijaya Ramesh 2011). The open burning of plastics can pose a significant risk to human health, including an increased risk of heart disease, respiratory issues, neurological disorders, nausea, skin rashes, numbness or tingling in the fingers, headaches, memory loss, and confusion (Adetona et al., 2020; Azoulay et al., 2019; Kováts et al., 2022; Velis and Cook, 2021; Verma et al., 2016). In addition, discarded plastic bags are often repurposed as bird repellents, and plastic waste can be carried into fields by wind or rain, where it can accumulate and cause harm (Pathak et al., 2023).

Undisposed, improperly disposed or used plastic packing material & bags do not let water and air to go into earth which causes depletion of underground water source. Additionally, plastic degraded by sunlight into smaller toxic parts contaminating soil and water where they can be ingested by animals and hence enters the food chain especially in the aquatic animal. For aquatic biota like mammals, sea turtles and seabirds, polythene waste is considered as a main risk that causes intestinal blockage when ingested unintentionally (Spear et al. 1995; Secchi & Zarzur 1999; Denuncio et al. 2011). It also affects soil fertility, preventing degradation of other normal substances, which poses threat to whole world. The biodegradable polymers are designed to degrade quickly by the microbes due to their ability to degrade the majority of the organic and inorganic materials, including lignin, starch, cellulose and hemicelluloses (Kumar et al. 2013).

The rapid industrialization, urbanization and other developments have resulted in a threatened clean environment and depleted natural resources. The development of human activities, the increase in the standard of living and higher consumer demand have amplified pollution of air, water, soil, the use of disposable goods or non-biodegradable materials, and the lack of proper facilities for waste (Gavrilescu and Chisti, 2005). Advanced techniques or technologies are now possible to treat waste and degrade pollutants assisted by living organisms (microbes, plants, animals).

Prior to the COVID-19 episode, several countries were considering about prohibition on single-use plastic items as a war was being pursued against single-use plastics. Sustainable alternatives were introduced to consumers and corporations were panned for contributing to plastic menace. India was making strides toward getting rid of single-use plastics by 2022, States were forbidding such products at their level.

In spite of the beneficial outcomes on environmental condition, this pandemic has activated negative impact on ecosystem. This pandemic scenario has raged the plastic threat in forms of PPE coveralls, face shields, gloves & masks, body bags, packaging of sanitizer dispensers and restaurant takeaways. Appropriate care and removal of such products is inadequate from single-use plastic which is resulting into littered streets across the world with disposable masks and gloves. In numerous nations sustainable waste management has been restricted and many cafés have quit serving in reusable cups and switched to single-use utensils. Some of these products cannot be recycled and they piled up on landfill after primary use, while a few items, for example, soap & hand sanitizer bottles, face shields and goggles are manufactured by using recycled plastic materials.

According to an article published by World economic forum 8 million tons of plastics disposed into oceans every year adding to the estimated 150 million tons already circulating in marine environments. One examination gauge could make 66,000 tons of tainted and 57,000 tons of plastic bundling waste. The Covid-19 circumstance has forbidden many practices like zero waste options and develop returnable or reusable systems.

According to American lawyer Waldman, the new plastic ban ordinance could result in financial benefits for restaurants over time, as it would reduce the need for plastic utensils and other disposable plastic items, potentially saving them money in the long run (Divya, 2022). In an effort to encourage customers to bring their own bags, many large retailers such as Pantaloons, Star Bazar, and Westside have replaced plastic bags with paper and cloth bags and even started charging customers for shopping bags (Barkha, 2018). Local shops have also switched to alternatives such as using old newspapers to wrap items, paper envelopes for medicines, and carton bags for sarees (Brinda, 2022). A study revealed that women (94.76%) were more willing to use paper bags compared to men (85.06%), and people over 35 years old showed a similar level of willingness. The study also found that the reuse of plastic and polyethylene varied significantly based on occupation, with people with higher qualifications being less likely to reuse plastic waste compared to those with less education (Sahu and Mishra, 2022).

The problem of waste can be solved to some extent by using biodegradable plastics; consequently, there is growing attention in degradable plastics. Starch-based degradable plastics is most commonly suggested for uses in composting of lawn, garden and shrub litter, which could lessen the volume of material entering the landfills by up to 20% (Lee et al. 1991). Attention in using biodegradable plastics for packaging, medical, agricultural and fisheries applications has increased in last decades (Orhan et al. 2004; Leja and Lewandowicz 2010). However, none of biodegradable of plastics was efficiently biodegradable in landfills, therefore none of the products has gained extensive use (Anonymous 1999; Kathiresan 2003).

Decomposition or destruction of contaminant molecules by the action of the enzyme secreted by microorganisms is known as biodegradation. Microbes may be able to breakdown the polyethylene structure since the chemical structure of polyethylene is similar to that of linear alkanes, which are known to be biodegradable (Albertsson et al., 1987). Commonly used methods for plastic disposal such as land-filling, incineration and recycling were proved to be inadequate for effective plastic waste management, and hence there is growing concern for use of efficient microorganisms meant for biodegradation of recalcitrant synthetic polymer biodegradation using efficient microorganisms (Seneviratne et al. 2006).

Bacteria, fungi and algae are the biological factor that degrades plastic naturally (Rutkowska et al. 2002). Bacterial degradation of polyethylene and paraffin compared and found that bacteria utilized polyethylene as carbon source (Jen-hou and Schwartz 1961). *Mucor circinilloides* and *Aspergillus flavus* isolated from municipal landfill area, showed promising degradation of low-density polythene degradation by analyzing CO_2 evolution test, scanning electron microscopy (SEM) and colonization studies (Pramila and Vijaya Ramesh 2011). In vitro degradation of LDPE by using six strains of *Aspergillus* spp. and two *Fusarium* spp., revealed that plastic biodegradation was due to active enzymes produced by this fungal strain (Kumar et al. 2013).

Polythene and plastic degraded to various extent by *Pseudomonas* spp. (37.09% and 28.42%) *Streptomyces* spp. (46.16% and 35.78%) and *Aspergillus* spp. (20.96% and 16.84%) in 6-month period in liquid (shaker) culture (Usha et al. 2011). According to Samat et al. (2023), polypropylene metallized film (MFPP) can undergo degradation of up to 25.29% and 22.13% when pretreated with UV and heat, respectively, by *A. terreus*.

Degradation of plastic cups and polythene bags studied using bacteria and fungi for one month period, among which bacteria, *Pseudomonas* spp. degraded 20.54% of polythene and 8.16% of plastics, while fungal species, *Aspergillus glaucus* degraded 28.80% of polythene and 7.26% of plastics (Kathiresan 2003). A Summary of studies on biodegradation of plastics are given by Kale et al. (2015) in which it can be understood that there are a large number of potential fungal strains which have the capacity to degrade plastics. Furthermore, Elsamahy et al. (2023) found that a yeast consortium (LDPE-DYC) showed a high growth rate on LDPE as the sole carbon source, resulting in a significant reduction in tensile strength (63.4%) and mass reduction (33.2%) of LDPE.

Microorganisms initiate the degradation process by colonizing on the polymer. Earlier reports denote that a group of enzymes involved in breaking down the complex polyethylene structure. Santo et al. (2012) has proven the laccase enzymatic action resulting into reduced molecular weight and increased carbonyl index of the polyethylene. Khan et al. (2022) reported that *Penicillium citrinum* has the potential to degrade LDPE film up to $47.22 \pm 2.04\%$ after pretreatment with nitric acid and treatment with laccase, lipase, esterase, and Manganese peroxidase (MnP) enzymes.

Though there are lots of reports demonstrating the potential of plastic degrading microbes, but none of them found to have practical application, thus there is a strong need to screen efficient organisms and developing technologies capable of degrading plastic efficiently without affecting the environment.

Solid waste generated by domestic, commercial and industrial activities is often disposed indiscriminately. In Vadodara as per survey conducted by Mehta and Pandey (2014) MSW Collection is conducted in two stages. In first stage, the waste collected from door to door is transported to dustbins and open dumps. In this stage, collection is not very efficient even though large numbers of private sweepers are engaged in waste collection from door to door at a nominal charge. Most residents drop the waste outside their residence, which in-turn is swept away by street sweeping and lifted by means of handcart or by rag pickers to the nearby open dumps. In second stage waste filled dumper placer Container is replaced with empty dumper placer container by dumper placer vehicle. The waste is transported to the designated dumpsite. Waste from open dumps is collected in trucks/tipper trucks/tractor manually or by JCB’s and loaders and finally transported to the designated dumpsite.

The bio-degradable waste is not segregated either at the primary collection points, secondary collection points, or dumping sites. Most of the bio-degradable waste are found to be eaten by animals at the grazing on the open dumping sites. Non-biodegradable Wastes is disposed off at the dumping sites along with other wastes without any prior processing.

Manual handling of solid waste during primary collection is an acceptable practice in the city. Safai Karamcharis involved in primary collection of MSW do not use any Personal Protection Equipment (PPEs) such as face masks, disposable gloves, boots, hats, and proper safety clothing (sturdy colored uniform) to avoid direct contact with waste and reduce the likelihood of on-the job injury.

In the present scenario waste management and handling process is unplanned due to lack of proper infrastructure, awareness among the public and its involvement. No target-oriented awareness programs conducted in the past for solid waste management improvement or for waste segregation. A planned and concerted effort is required to bring about awareness among the public and make them realize their responsibilities as individuals and as a community. In summary, public awareness, community participation, transparent administration, accountability at all levels is the need of hour so as to ensure success of any MSW management plan.

It is essential to establish environmentally friendly methods for decontamination of the ecosystem. In this matter, fungal community possesses machinery involving enzymes that catalyze a diversity of reactions, consequently, they are highly effective for the degradation of environmental toxins (S´ anchez, 2020). Microbial strains isolated from dumpsites and polluted soil have been reported for being more potential to degrade plastic materials. Their main feature in bioremediation mechanism is the production of extracellular enzymes like laccases, peroxidases & esterases and are directly initiating microbial attachment on the PE surface and the consequent biodegradation (Wei and Zimmermann 2017). According to Wróbel et al. (2023) report, isolating plastic-degrading bacteria and fungi from waste landfills can be an effective strategy for collecting microorganisms with high potential for polyethylene (PE) and polypropylene (PP) degradation. Additionally, Kumar et al. (2021) demonstrated the presence of potential genes in the fungal strains associated with the biodegradation of different types of plastics such as polyethylene, polyethylene terephthalate, and polystyrene. However, there are fewer reports available involving enzymes responsible the PE degradation process.

Hydrolases are essential for enzymatic cleaving the polymer structure wherein ester bonds are fragmented through a nucleophilic attack on carbonyl carbon atoms formed by previous oxidation reactions (Devi et al. 2016). Esterases and lipases are hydrolases that are instrumental in polymer degradation (Sangale et al. 2012; Mohan et al. 2016). Bacterial protease from species like *Brevibacillus* spp. & *Bacillus* spp. are capable of degrading the polyethylene (Sivan A, 2011).

Study conducted by Kathiresan (2003) revealed that the high diversity of microorganisms present in mangrove soil is capable of degrading plastics. Utility of microbial consortia isolated from plastic garbage reported with enhanced biodegradation potential. (Skariyachan et al., 2016) This approach is ideally accepted, while microbial consortia enhance the rate of de-polymerization by mechanism of co-metabolism. (Tribedi et al. 2012; Bhardwaj et al. 2012). Previously reported work in this particular research area has mainly dealt with lab-simulated experiments.

This research aspect requires in-depth study of the enzymes involved in this process, enhancement of the degradation and its potentiality under natural conditions. The present study emphases on finding out the non-biodegradable component of MSW and identifying the potential fungal strains isolated from the dumpsites of Vadodara city for the efficient degradation of non-biodegradable element especially the widely used polyethylene bags.