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A Study of Solid Waste Management (SWM) and Conversion of Wet Waste and Vegitable Market Waste into Feeds and as alternative Energy of GHMC- Alwal Circle, Hyderabad in Telangana.

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Abstract: The overall goal of this study on urban solid waste management is to collect, treat and dispose of solid wastes generated by all municipality authorities and population groups in an environmentally and socially satisfactory manner using the most economical means available. Greater Hyderabad Municipal Corporation (GHMC) are usually authorized to have responsibility for providing solid waste management services to the abovestudy area i.e Alwal Circle, As Hyderabad city grow economically, the industrial activities and consumption patterns drive up a growth of solid waste quantities. At the same time, increased traffic congestion adversely affects the productivity of the solid waste fleet. Productivity loss is exacerbated by longer hauls, open lands are turning as dump yards for commertial and household waste. The main objective of the study is educating a. waste generating communities for segregation, b. rag-pickers for safe handling & c. segregating agencies for recycling to create economical values like investment, employment etc.
Keyword: solid waste fleet, industrial activities, economical values

Introduction: Alwal was a part of Jagir of Sir Kishen Pershad, Prime Minister of Nizam, during the 1920s. Sir Kishen Pershad used to have his 'Devdi' (palace) at Alwal and used to spend time here during summer. After Independence, Hyderabad attracted international opportunities and expanded it's municipal limits year by year to form Greater Hyderabad Municipal Corporation (GHMC) by adding it's surrounded areas like kukatpally, miyapur, alwal etc. Alwal is under Hyderabad Municipal Corporation, which is most safest and best livable area because it was surrounded with Indian Army Corps of EME, Army Quarters and Rashtrapati Nilayam. It means, maintaining cleanliness is higher priority in this zone. Alwal Municipal area's rapid population and commercial activates growth plying vital role in waste generation and collection. Also, analyzed economic calculations. More than half of *dry* waste is generated from households and wet waste is generated from commercial areas. Apart from that few household around slum area are openly dumping and burning waste, the wards and water ways are facing a looming waste crisis that threatens to impose substantial environmental, social, and financial costs on our societies.

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The overall goal of urban solid waste management is to collect, treat and dispose of solid wastes generated by all urban civilians and offices in an environmentally and socially satisfactory manner using the most economical means available. Local governments, municipalities/corporations are usually authorized to have responsibility for providing solid waste management services, and most local government laws give them exclusive ownership over waste once it has been placed outside a home or establishment for collection. As cities grow economically, business activity and consumption patterns drive up solid waste quantities. At the same time, increased traffic congestion adversely affects the productivity of the solid waste fleet. Productivity loss is exacerbated by longer hauls required of the fleet, as open lands for disposal are further and further away from urban centers. The challenge is to rationalize worker and vehicle performance, while expanding services to a growing urban population.

This study discovers the possibility of decoupling waste generation, and thus consumption, from rapid urban growth. Few arrangements of waste reduction, in terms of residual waste and/or total waste, are highlighted from household and offices across the study area. In each colony, decisions to reduce or divert waste were driven by a different factor, such as lack of awareness, time management of waste picker, arrangement of roadside dustbins, recycling units and so on. else tons of waste will reach water sources and change the fate of other schemes as.

Mission Kakatiya:

Water bodies/stream attracting tourists with their beautification has been an integral part of eco-tourism in Telangana. River Musi is connected with many water bodies from it starting point (anatagiri hills) to ending point (edulabad) (Please see reference 01). It is attracting millions of tourists/local civilian and employing thousands.

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Now, the city is transporting so much garbage due mismanagement of MSWM in greater Hyderabad region. Alwal is also having two connected ponds (ban cheruvu & Alwal cheruvu) of Musi river basin, which were dumping tons garbage every year with cultural and refreshment community activities in and around water bodies. This is kind of failures wasting the millions rupees of investment in Mission Kakathiya programme.

Rain Water Harvesting:

In order to recharge ground in our Greater Hyderabad Municipal Corporation (GHMC) limits, government is passing several Go's (Please see reference 02) about digging of shaft in every house/building/apartment etc. but, residents are also not maintaining aquifers properly. Various rain water harvesting schemes are implemented by the state and ULB governance, like check dams construction, percolation tanks, farm pond and recharge shaft, etc., . Also, developed Harithaharam (planting of trees) to raise the water table and improve the water quality as per MSWM rules of Government of India (GOI).

1.1. MSWM rules in India

As we aware that Solid Waste generation levels reached it's peak levels and demanding thousands of hectors land in every nation – this is the objective for preparing "Solid Waste Management Rules in every state/province/country for livelihood sustainability including India (**Annexure 01**). The Ministry of Environment and Forest (MoEF) of the government of India has issued MSW (management and handling) rules in the year 2000(***Please check reference 03***) for scientific MSWM ensuring proper collection, segregation, transportation, processing and disposal of MSW and upgrade of the existing facilities to arrest contamination of soil and ground water. As per the provision, CPCB has been assigned to *M. Sharholy et al. / Waste Management 28 (2008) 459–467 465* monitor the implementation of these rules, and the municipalities will be required to submit annual reports regarding the status of MSW in their areas to the CPCB. These rules are applicable to every Municipal Authority in India, which is responsible for MSWM. In addition, there are Municipal Corporation Acts by different states such as the *Delhi Municipal Corporation Act 1959, Uttar Pradesh Municipal Corporation Act 1959 and Karnataka Municipal Corporation Act 1976*. These Acts also deal with environmental

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pollution caused by improper disposal of MSW, for example *The Delhi Plastic Bag (Manufacture, Sales and Usage) and non-biodegradable garbage (control) Act, 2000*, was enacted to prevent contamination of food-stuff carried in recycled plastic bags, reduce the use of plastic bags, throwing or depositing non-biodegradable garbage in public drains, roads and places open to public view. Local authorities often see MSWM as a poor service compared to other basic services because MSWM can barely recover operating costs. However, most of the municipalities are unable to provide the desirable level of conservancy services. Due to a number of problems, they have not been very effective as far as SWM services are concerned (*Siddiqui et al., 2006; Kansal, 2002; MoEF, 2000; Gupta et al., 1998*).

Apart from that, the efforts of Telangana state policies on SWM are very useful rules for urban sustainability, especially for composting process rules to save land (filling), but the involvement of medical health officers (MHO), Town Mission coordinator, Environmental Engineer, Sanitary Inspectors, Community Organizers etc is most urgent to bring the SWM rules into practices by every citizen. else, the Telangana prestigious programmes Parisubramina Pattanalu and Pattana Pragathi programs will be on government orders only.

MSW characteristics and composition:-

An examination of the composition and characteristics of wastes in different parts of the country underscores the profound influences of national income, socio-economic conditions, social developments and cultural practices, and thereby focuses attention on the importance of obtaining the data locally. Since different kinds of solid waste management system are designed for the future as well as the present, careful consideration should be given to changes that may occur during the design life of a system. Changes are inevitable, occur at an increasingly rapid rate in response to the increasing pace of social and 34 technological development and the nature and extent of such changes can not be predicted with accuracy. A built-in flexibility in the waste management system hence becomes essential. Nevertheless, it is possible to identify some of the factors that are likely to cause changes in waste composition and characteristics, which will enable planners to make reasonable judgments about the future. The composition and the quantity of MSW generated form the basis on which the management system needs to be planned, designed and operated. In India, MSW differsgreatly with regard to the composition and hazardous nature, when compared to MSW in the western countries(Gupta et al., 1998; Shannigrahi et al., 1997; Jalan and Srivastava,1995). The composition of MSW at generationsources and collection points was determined on a wetweight basis and it consists mainly of a large organic fraction(40–60%), ash and fine earth (30–40%), paper (3–6%)and plastic, glass and metals (each less than 1%). The CN ratio ranges between 20 and 30, and the lower calorific value ranges between 800 and 1000 kcal/kg.

1.3. **MSWM mechanisms in India:** The two leading innovative mechanisms of waste disposal being adopted in India include composting (aerobic composting and vermi-composting) and waste-to-energy (WTE) (incineration, pelletisation, biomethanation). WTE projects for disposal

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of MSW are a relatively new concept in India. Although these have been tried and tested in developed countries with positive results, these are yet to get off the ground in India largely because of the fact that financial viability and sustainability is still being tested (Lal, 1996; Khan, 1994). Different methods for the disposal and treatment of MSW have been discussed in the subsequent section.

Few urban municipalities in India are implementing proper collection, segregation, technology & Processing, trading etc with trade federation partners. A solid waste management scheme should be adopted for the villages/towns strictly adhering to Solid Waste Management Rules (2016). As per the National Action Plan for MSW Management by CPCB (prepared by CPCB as per Hon'ble NGT directives), the villages/towns that generate upto 50 TPD and from 50 – 100TPD, the Local Governing Bodies should follow Schedule II strictly for MSW management which is collection, segregation, storage, transportation, processing and disposal of MSW. Aerobic biological method for stabilization of waste can be viable solution. Also, bio-gas plants may come which can cater energy demand(***Please check reference 04***).

The Govt. of Telangana notified the State Solid Waste Management Policy and Strategy and State Policy on Faecal and Septage Management in the month of September 2018 in compliance with the SWM Rules 2016. Bhopal Municipal Corporation is successfully implemented this MSWM rules from 2016, developed new concepts for increasing self-employment (household income) for sustainable hood.

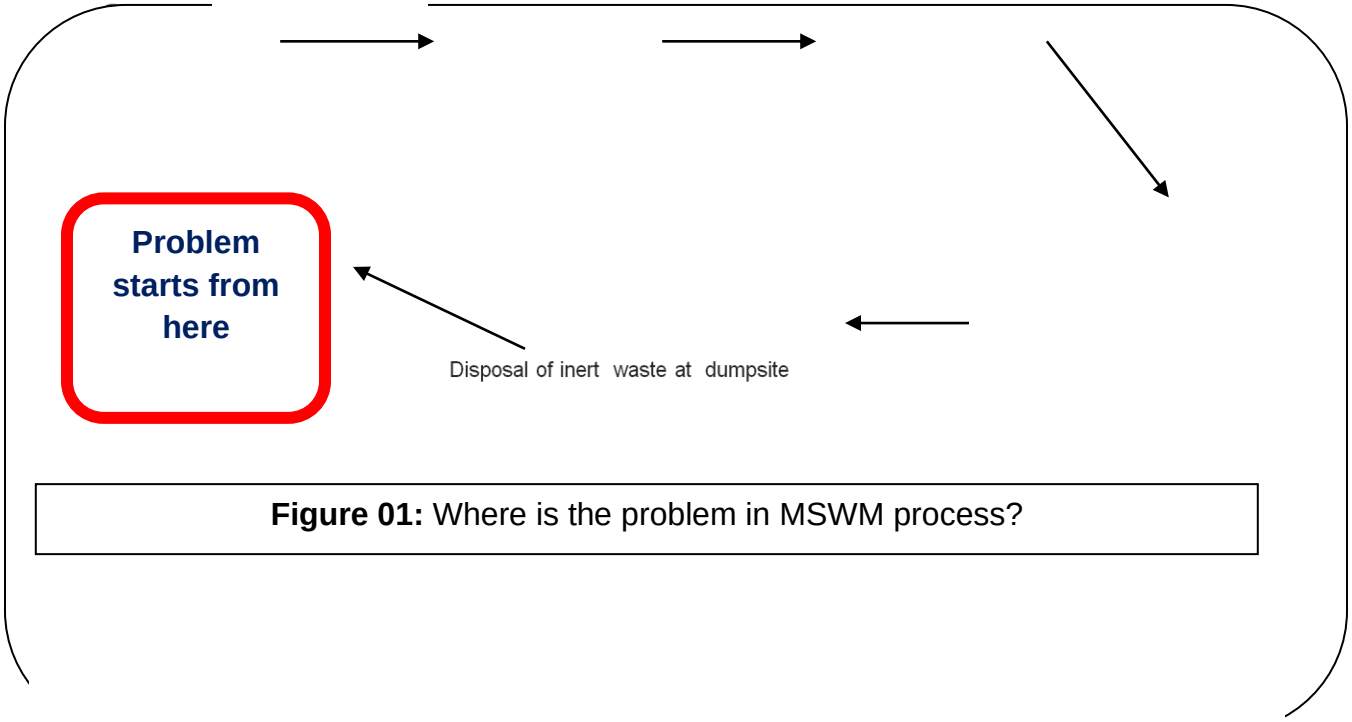

Figure 01: Where is the problem in MSWM process?

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1.4 Waste Transport and Disposal

Figure 02: Waste Transportation and dump management

Waste Generation Sources: Daily consumption of species at livelihood or work place is origin of waste generation. They discharge several types of material, which we can recycle, reuse and nature manure. Few regular waste generation sources are

- Cushion Bags
- Plastic chipsa
- Lumps (Gatta)
- Daana (Plastic Granules)
- Sheets
- Amino Acid
- Solid compost
- Liquid compost
- Paver blocks
- Eco-friendly bags
- Paper Bags (Photos)

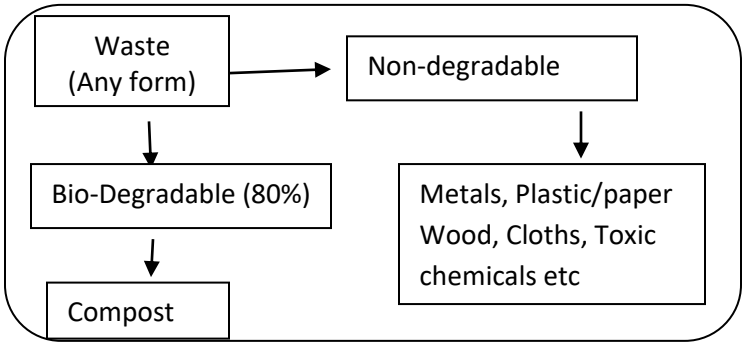

Fig 03: **Waste Generation Sources**

Apart from the above, the regular kitchen (food) wastes at homes, restaurants, markets, functions or communal gatherings are dumping tons of wet waste. Particularly, urban areas are facing several problems with the wet waste because they are sheltering health harming mosquito's, pigs etc. apart from that, the stagnant water at waste dumping places carry pollutions into ground water through water percolation and contaminate flowing surface water. So, few practices are most urgent of to reduce the stress on nature or mother earth.

- **Cushion Bags – Management:** Most of the cushion bags are using at shopping places and packing part. Customers are buying, using and throwing those cushion bags. We must educate

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them for “safe handling practice”, else this cushion bags will cause death of street animals, hunk holes of pipelines etc.

- **Plastic chips – Recycling**: Every used plastic may change it’s grade, but may never turn as “zero usage”. So, collect, process and recycle the waste plastic for reuse purpose.
- **Lumps (Gatta) – Reuse**: If we keep any waste into reuse purpose, the society will get two benefits, first one is generating of employment and second one is environment safe guard (to protect economy form disasters like floods, heat waves, gales etc).
- **Acids – Chemical compositions**: Your body needs 20 different amino acids to function correctly. Nine of these amino acids are called essential amino acids. Essential amino acids must be consumed through the food you eat. Essential amino acids can be found in a variety of foods, including beef, eggs and dairy. So, Soil (Chemicals) contamination(s) with Solid Waste should be prevent

3.1. Solid Waste:

Solid waste management is a universal issue affecting every single person in the world. Individuals and governments make decisions about consumption and waste management that affect the daily health, productivity, and cleanliness of communities. Through airborne particles from burning of waste, harming animals that consume waste unknowingly, and affecting economic development such as through diminished tourism. Unmanaged and improperly managed waste from decades of economic growth requires urgent action at all levels of society. The term municipal solid waste (MSW) is normally assumed to include all of the waste generated in a community, with the exception of waste generated by municipal services, treatment plants, and industrial and agricultural processes (Tchnobanoglous, G and Kreith, F., 2002). Urban waste management is expensive. Waste management can be the single highest budget item for many local administrations in low-income countries, where it comprises nearly 20 percent of municipal budgets, on average. In middle-income countries, solid waste management typically accounts for more than 10 percent of municipal budgets, and it accounts for about 4 percent in high-income countries. Budget resources devoted to waste management can be much higher in certain cases. In the urban context the term municipal solid wastes is of special importance. The term refers to all wastes collected and controlled by the municipality and comprises of most diverse categories of wastes. It comprises of wastes from several different sources such as, domestic wastes, commercial wastes, institutional wastes and building materials:

The Public Awareness for controlling waste:

Cumulative household, institutions, market and road walkers’ population growth was continuously generating Waste in the alwal area and demanding a “management practice” like segregation, safe handling and collecting. We created lack of household awareness about wet and dry segregation bin. Hope it is not enough to reach “maximum zero waste generation” in this particular zone. It required a continuous awareness in community, schools and public places, else

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the garbage odor will reach our doors in several ways like flashfloods, gales etc. also, also, it will reach into species food web.

Under this study, regular campaign(s) on “Importance of waste segregation” conducted in all colonies - Interacted households, schoolchildren, shops, hotels and organizations. We also educated about importance of “waste segregation, recycling & reusing possibilities and Sustainable livelihood of our children.

Apart from that, waste impact on natural resources (Pancha bhuthas or five elements) explained, health, inflation etc explained for both rag-pickers and citizens.Motivated individuals such as headmasters, doctors, religious leaders, and etcetera, from the concerned communities (chicken and mutton shops, vegetable sellers, fast-food centre’s etc) will be engaged as volunteers and help convey the message to the public as well as function as role-model citizens. Invited several volunteers, education institutes, environmentalists etc joined in campaining door to door in colonies of Alwal municipal area.

Environmental Degradation, Human Health & Waste:

Improper handling of solid waste and indiscriminate disposal in open spaces, road margins, tank beds, and etcetera, give rise to numerous potential risks to the environment and to human health. Direct health risks mainly concern those working in the field without using proper gloves, uniforms, and etcetera; a high percentage of waste workers and individuals who live near or on disposal sites are infected with gastrointestinal parasites, worms, and related organisms.10 For the public, the main risks to health are indirect and related to poor water, land, and air quality. In addition, infrequent collection of waste provides an attractive breeding ground for flies and rats.11 The most obvious environmental damage caused by solid waste is aesthetic, i.e. waste that litter public areas is ugly and smelly. A more serious risk is the transfer of pollution to ground water and land as well as the pollution of air from improper burning of waste. Many waste activities generate greenhouse gases; e.g., landfills generate methane and refuse fleets are significant sources of carbon dioxide and nitrous oxide. Open burning dumpsites produce volatilized heavy metals (e.g. mercury and lead), dioxins, and furan. Leach-ate from unlined and uncovered dumpsites contaminates surface and ground waters. A damaged local environment will first hit the most vulnerable groups of society, those who lack the resources needed to reduce the negative effects of a degraded environment. In addition, people living under poor circumstances are also directly dependent on their close natural environment for their daily

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survival. Apart from that paper and plastic waste generation levels are very high in Alwal area because of commercial and government prestigious organ “military campus”. We can easily educate them about handling, but authorities need to prepare a recycling unit near to alwal with self-help groups or NGOs.

3.7. Cultural Taboos and Social Stigma:

Another problem related to waste in India is festival, cultural/traditional and social gathering. These gatherings are providing commercial values for sustainable self employment (coconut/ fruit/ flower/ decoration/ puja material sellers) Ex 01. Ganesh (Nimarjanam) /Devi Navaratrulu and Kartikamasam – these festivals are largely associated with water (Cheruvu/Kuntas). Devotees pray Ganesh idol or Bathukamma (more medicinal flowers) or lord shiva in karthikamasam and generate tons of waste in each area. Especially, the Ganesh idol and bathukamma flowers thowing into water bodies and polluting more and more. See the adjacent figures, how people throwing waste into water bodies.

Raised Awareness and Changing Perceptions:

In order to make long-term, sustainable changes, people at the grassroots level must feel ownership and commitment to all of the project interventions. An important aspect in order to change norms, attitudes, and behaviors is naturally to raise the public's level of awareness, inform, and trigger debates about issues such as production and consumption patterns, actor responsibilities, sustainable economic growth, and so forth. It is central that waste is understood and discussed as part of a cyclical process of production, consumption, and recovery. Another

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project objective is to remove the social stigmas and taboos surrounding waste; instead of perceiving waste as something dirty, it should be seen as a lucrative resource from which one could make a living. By offering competitive salaries, good working conditions, professional uniforms, and etc, to the employees, we hope to change negative perceptions surrounding waste.

Field Investigations:

Field investigations are necessary for providing the basic data on solid wastes and are carried out in three ways:

- counted of vehicles at disposal sites – carriying 10 to 15 tons of waste
- Sorting of wastes into predetermined components for weighing and sampling in order to determine the percentage of each component and the physical and chemical characteristics of the wastes.· Visiting institutional and industrial sites to identify wastes being generated and disposal methods being used.

The weighing of loaded and unloaded vehicles is accomplished with a weighing scale or weighbridge with a capacity of 10,000 kg. to 15000kg The loaded vehicles are weighed when they enter the disposal site and empty vehicles are weighed when they leave the site after unloading. Weighing is carried out each day of weighing period in order to determine the average weight. Ideally the weighing scale should be operated during the entire daily period of operation of the landfill site, round the clock, if necessary. A shift system should be employed, the weighing team comprising four workers for each scale – a supervisor, an assistant and two helpers moving the scale platform to the desired spacing for each vehicle. The quantities of waste measured at disposal sites more correctly reflect the quantities being disposed rather than those generated since the measurements do not include: ·

- Waste salvaged at the site of generation ·
- Waste disposed of in unauthorised places-empty lots, alleys, ditches etc. ·
- Waste salvaged by collectors ·
- Waste salvaged at the disposal site

Differences between the two are insignificant with well-managed collection systems, enlightened public attitude and strict enforcement of legislation. This is frequently not the case, particularly in some cities and it is then necessary to measure waste quantities at source. Flintoff (1984) describes a method for collecting samples with the active cooperation of householders wherein containers or plastic bags are filled by a representative number of householders and labeled before being taken to the depot where the contents are weighed and the volume measured

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Rag- Pickers:

Thousands of people in India find livelihood opportunities in the area of waste management as, the "rag-pickers" (the kabadiwalas in Hindi). A SWM project must hence be understood in this informal yet organised setting. Groups (SHGs). In order not to bypass these individuals, they will be prioritised in the employment process and offered continuous employment in the projects. This kind of projects will be employ thousands of people, from Self Help

Street Sweeping: This term applies to wastes that are collected from streets, walkways, alleys, parks and vacant lots. In the more affluent countries manual street sweeping has virtually disappeared but it still commonly takes place in developing countries, where littering of public places is a far more widespread and acute problem. Mechanised street sweeping is the dominant practice in the developed countries. Street wastes include paper, cardboard, plastic, dirt, dust, leaves and other vegetable matter.

Processing and management of Solid Waste: Municipal solid waste from the various resources will be segregated at point source within the generation or the resulted source point then it will be processed there itself by the rag-pickers and then based on the material it will be employeed in the four aspects of municipal solid waste conversion into useful products as

1. Biodegradable – Compost/Vermocompost.
2. Bio-Gas generation
3. Non Biodegradable
4. Papers
5. Metals

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6. Hazardous

1. Biodegradable – Compost-

Garden (road divider plants chipped leaf & vegetable market waste rehabilitated compos t and used for alwal municipal garden plants. It is easy will give Compost / Vermi composting involves stabilization of organic waste through the joint action of earth worms and aerobic microorganisms. Initially, microbial decomposition of biodegradable organic matter occurs through extra cellular enzymatic activity (primary decomposition). Earth worms feed on partially decomposed matter, consuming five times their body weight of organic matter per day. The ingested food is further decomposed in the gut of the worms, resulting inparticle size reduction. The worm cast is a fine, odorless and granular product. This product can serve as a biofertilizer in agriculture. Vermicomposting has been used in Hyderabad, Bangalore, Mumbai and Faridabad. Experiments on developing household vermicomposting kits have also been conducted. However, the area required is larger, when compared to dry composting (Ghosh, 2004; Bezboruah and Bhargava, 2003; Jha et al., 2003; Sannigrahi and Chakrabortty, 2002; Gupta et al., 1998; Reddy and Galab, 1998; Jalan, 1997; Khan, 1994). The dried hydrocarbon waste segregated will be chapped into required size and the other mixing materials, and then introducing the worms will be carried out.

Bio-Gas generation: The wet food material and other bio degradable material must be grinded properly into paste type and the required water will be added then introduced into the best performing bio-gas unit. After biogas generation the solid waste remaining will be converted into fertilizer.

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3. Non Biodegradable (Plastic/Glass/Paper/Cosine/Metals): One of the major ways that solid waste contributes to climate change is its generation of greenhouse gas (GHG) emissions. The 1.6 billion tonnes of carbon dioxide–equivalent (CO2-equivalent) emissions estimated for 2016 are anticipated to increase to 2.6 billion tonnes by 2050.

Emissions from solid waste treatment and disposal, primarily driven by disposal in open dumps and landfills without landfill gas collection systems, were calculated using the CURB tool,1 and they account for about 5 percent2 of total global GHG emissions (World Bank 2018a; Hausfather 2017). GHG emissions result from inadequate waste collection, uncontrolled dumping, and burning of waste. Waste releases methane gas when disposed of in an oxygen-limited environment such as a dump or a landfill and releases pollutants and particulate matter during inefficient transportation and burning. Methane, generated from decomposing organic waste, is the solid waste sector's largest contributor to GHG emissions. It is many times more potent than CO2. 3 Efforts to formalize the management of waste can significantly reduce GHG emissions. For example, a study by Zero Waste Europe concluded that the European Union could eliminate as much as 200 million tonnes of GHG emissions per year by 2030 with improved waste management practices (Ballinger and Hogg 2015).

Communities/apartments/shopping complexes/industries are commonly not managed and disposed properly and cannot be recycled as well. Since most plastics are not biodegradable, they remain in the environment for a longer duration of time and do not decay, eventually breaking down into smaller chunks known as micro-plastics. Mico-plastic is dangerous for aqua production & growth (***Please check reference 05***) India has around 683 units that can produce approx. 2.4 lakh tonnes of single-use plastic per annum, according to the Central Pollution Control Board (CPCB). A single GO (No: 7640-H2, Dt: 02.07.22) banned single used plastic and closed operations and employment of production units. Those found to be flouting the single-use plastic ban can be fined under the Environment Protection Act 1986, which allows jail of up to five years, or a penalty of up to Rs 1 lakh, or both. Moreover, there are several municipal laws on plastic waste, which have their own penal codes. The country also comes in the list of top of 100 nations responsible for single-use plastic waste generations and needs to enforce urgent measures to switch to environmentally sustainable products and services as well as contrive technology that recycles plastic more efficiently. Most of plastic/cosine/Rexene items are comes under bio degrable, but we can use them for commercial/economical purpose. The food material, fruits,

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vegetable and other soft materials will be grinded into required paste then the yeast will be introduced enclosed system the synthesis Alcohol. The left over material will be other converted into compost or introduced in the vermin compost as a feed.

Rag-pickers tribulations: rag-pickers are facing so many tribulations. Few of them are challenging their sustainability. They are

A. Several areas waste generations are demanding second trip with 20 to 30% load capacity. They are unable to collect this quantity because of fuel consumption/prices.
B. They are collecting garbage without any safety kit. Some people unable to handle it.
C. Fever households are throwing at open places and not paying amounts to rag-pickers.
D. Subsidy for fuel expenses is most urgent for managing their vehicle and sustainability.
E. Alternate fuel (LPG/CNG/Battery) kit(vehicle) purchase subsidy upto 75% to 90% is urgent to save fuel cost and 100% waste collection.
F. CSR Intervention: CSR support to support the rag-pickers for purchasing gas kits/ glouses & cloths is most urgest

5. **Conclusions:-** I only feel angry when I see waste. When I see people throwing away things we could use – Mother Teresa. It means throwing waste outside without proper segregation, management and plan, species must sacrifice their life in coming decades. So, it is every one responsibility to recycle and reuse for controlling consuming of natural resources. Thee above study traced the "urgency of awareness on waste management to all urban civilians and importance of using management techniques (technologies) for controlling consequences for sustainable urban livelihood. Also, conducted several training programmes for waste "throwing people, pickers, segregation members and processing employees" separately to safe guard the "water bodies" in Alwal Municipal limits.

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