International Journal of Research (IJR)

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Vol. 9 Issue 01
January 2022

Current Status of Municipal Solid Waste Management in Jammu and Kashmir: A Review

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Abstract

Waste of different kinds poses threat to environment (both to biotic and abiotic components) in the form of pollution and we human beings standing at the ends of the food chains think ourselves as supreme creatures of Earth but the harsh reality is that we are just supreme trash generators. There is no doubt that all the waste that really comes out from the domestic, commercial, institutional and industrial sectors is not total waste in real sense. This waste can be reduced to a greater level by appropriate measure in fact some really valuable products can also be formed by turning waste into wealth. This all can be done by use of well-furnished Solid waste management techniques. More opulent the lifestyle of humans, more is the generation of waste but waste management is nothing like sledgehammering to crack a nut if the locals and the management authorities cooperate in waste management and help in implementing the plans designed at both national as well at state level. Some of the solid waste management reports depicting the status of management of waste in Jammu and Kashmir. Classification of different kinds of waste as per their sources is also given along with data from reports prepared by the State Pollution Control Board regarding the waste management.

Keywords: Solid waste, Pollution, CPCB, SPCB, Trash, Environment

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Background

We are consuming natural resources at a rate much higher than at which nature can regenerate them. As we consume the resources, we are also creating waste and pollution much faster than the rate at which nature can absorb them. This is no doubt an unsustainable way of living and it can lead to environmental and social catastrophe. This nature of humans to condone the activities causing harm to environment just because these give satisfaction to their modern life will be the cause of creating hell on Earth. Humanity's Ecological footprint is more than 1.5 which means we require 50% more than the earth area to sustain our consumption of natural resources and now here we are deteriorating what all we have, the only Earth, and

wishing of some other planet to give us shelter after sweeping the floor of Earth with our noses (***Rajagopalan, 2016***). Giant piles of waste everywhere around us not only give rise to air, water and soil pollution along with various deadly diseases but it also results in a new emerging kind of pollution called Visual pollution.

Waste is any material that is either thrown away or is discarded as useless and unwanted is considered as solid waste. At first glance, the disposal of solid waste may appear to be a very simple and mundane problem. In this age of lasers, micro-computers and spaceflight, it hardly seems possible that garbage disposal should present any great challenge. But many factors make solid waste disposal a complex problem of huge proportions for a modern- industrial society especially in developing countries that also when it comes to treatment of waste or its final disposal which is usually an open dump or in improperly built landfills. These kinds of pollution can lead to a variety of diseases in humans, thereby threatening public health (***Bhatia, 2007***).

Municipal waste, a combination of household and commercial refuse, amounts to about 230 million tons per year in the United States. That's just over 2 kg per person per day which is twice as much per capita as Europe or Japan, and five to ten times as much as most developing countries. Open unregulated dumps are still the predominant method of waste disposal in most developing countries. The most notorious are the "Smoking Mountain" because of continuous smoldering fires in the open dumps. To make the condition even worse oceans are treated as dumping sites. By all accounts, every year some 25,000 metric tons of packaging, including half a million bottles, cans and plastic containers are dumped at sea (***Cunningham and Cunningham, 2008***).

Although they only account for 16 percent of the world's population, high-income countries combined are generating more than one-third (34 percent) of the world's waste. The East Asia and Pacific region is responsible for generating close to a quarter (23 percent) of all waste. And by 2050, waste generation in Sub-Saharan Africa is expected to be more than triple from current levels, while South Asia will generate more than double its waste stream (***World Bank Report, 2018***).

According to a study (***Annepu, 2012***), the daily per capita generation of Municipal solid waste in India ranges from 200 g to 870 g depending upon the region, lifestyle and size of the city. The per capita generation of waste is increasing by about 1.3% per year. The total amount of solid waste generated annually in Indian cities is about 62 million tonnes. 70% of Indian cities don't have adequate waste transportation facilities. Out of total municipal waste collected near about 90% is dumped openly and 5% is composted. This ultimately results in streets full of garbage, choked drains and urban canals covered with filth. The decomposition of

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Vol. 9 Issue 01
January 2022

organic components produced methane which is a significant contributor to global warming.

The quantity and composition of municipal solid waste in India vary from place to place and bear a rather consistent correlation with the average standard of living. Studies carried out in 59 selected cities in India revealed that there are many shortcomings such as inadequate manpower and financial resources in the existing practices of managing the municipal solid waste. To overcome the deficiencies, an indicative action plan has been implemented incorporating various strategies and guidelines (***Kumar et al, 2009***).

Municipal Solid Waste is the most complex heterogeneous solid waste stream in contrast with more homogeneous waste streams, such as industrial or agricultural waste (***Rasool and Balwan, 2020; Wang and Nie, 2001***). The quantity of municipal solid waste is invariably higher in the developed nations compared to the developing nations. Typical waste characteristics of the developing nations are (1) high waste densities, (2) high moisture contents, (3) large organic fraction, (4) Cities with sweeping as well as open ground storage characterized by large amount of dust and dirt **(*Chandrappa and Das, 2012***).

Household and commercial refuse together in combination make Municipal solid waste which is generated from the living community (***Rajkumar et al., 2010***). Poverty, proliferation in urbanization, rapid population growth, and low level of living standards along with low level of environmental awareness can be regarded as the major cause of acceleration in continuous indiscriminate disposal of municipal solid waste (***Rachel et al., 2009; Ogu, 2000***).

1- Solid Waste Management

Tchobanoglous et al., 1993, were of the opinion that solid waste management may be defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations that are also responsive to public attitudes. Municipal solid waste is a heterogeneous mixture of paper, plastic, cloth, metal, glass, organic matter, etc. generated from households, commercial establishments and markets. The proportion of different constituents of waste varies from season to season and from place to place, depending on the lifestyle, food habits, standards of living, the extent of industrial and commercial activities in the area, etc (***Katju, 2006***).

As per a National Action for Solid Waste Management published by CPCB, 2016- Status of MSW Management varies from city-to-city and is based on the

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Vol. 9 Issue 01
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approach of the local bodies. The general observations as applicable throughout the country are summarized as under;

- Segregation of MSW at source or at household level is not practiced. Partial waste segregation practice observed in a few cities/towns where public are provided with infrastructure facilities and created awareness by the civic bodies.
- Bio-medical, slaughter house and other wastes get mixed with MSW at dust bins and finally reach landfill sites.
- Door-to-door collection of waste is not practiced in majority of city/town. However, organized and privately managed societies have segregated waste collection system in few pockets of cities/towns but, after retrieving recyclable materials, the segregated wastes are mixed again in nearby community bins, transport vehicles or at disposal site.
- Most of cities/towns do not practice covered transportation of wastes. The scenario is that the waste transporting vehicles are not well maintained for cleanliness; they look dirty/ filthy and even emit foul smell and litter wherever they pass through.
- The community bins set up are not maintained properly and cause public resentment (NIMBY syndrome). Stray cattle are attracted by such bins and become breeding place of rodents/fly. The foul smell prevails in the area due to not lifting waste regularly/timely.
- There are unaccounted generation of recyclable materials collected by waste pickers at source. These recyclable materials reach custody of informal sectors leaving behind the waste of less calorific value that cannot be utilize in waste-to-energy projects.
- Many cities/towns have set up waste processing plants, but they are not self-sustaining. Some of them are closed and remaining waste processing plants are running at loss due to lack of policy.
- The municipalities face problem in identifying new landfill sites. Each town/city has 2-3 open dumping grounds which have already been exhausted. The collected waste from cities goes directly to the dumping ground. The dumped waste is mixed in nature. Almost, entire waste collected is dumped and only in selected cities, waste is processed biologically or thermally.
- Landfill sites are not scientifically maintained and these dumps pose potential threat for ground water pollution and are likely cause deterioration of the ambient air quality.
- Local bodies do not have long term action plan for managing their city waste. Whatever scheme they implement for waste management, those are worked out on day-today requirement basis or for a short term remedial measures

p-ISSN: 2348-6848
e-ISSN: 2348-795X
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So from the report, it is clear that the status of waste management is not even better at national level thus having dream of waste management in Jammu Kashmir may be like for nothing still there are many strategies that can be adopted to manage waste in an efficient way. Solution is not to start living in recluse so that no waste is generated but to come out and stand for the management measures at individual level too. Following waste management methods can be adopted to make the process of waste management more effective:

2- Managing Waste at Source

Handling and segregation of waste at source is the first and foremost step in waste management as proper management at the source can divert a lot of material from entering the waste stream. This can be done both at domestic and commercial level. Various solid waste reduction techniques are also available so that when the waste is generated at source it can be reduced in volume by source separation, concentrating methods, incineration of municipal sludge and size reduction.
Collection of the waste can also be done effectively using handcarts or tricycles with containers or bins, tricycle with hydraulic tipping containers, mini trucks with hydraulic tipping containers, four wheeled mini trucks with international standard bins etc. And transportation can be done with the help of skip trucks, rear loading compactor trucks, and light commercial vehicle with tipping floor. Collection, storage and transportation have everything to do with the better management of solid waste.

Solutions to Biodegradable Waste:

a) Composting

Composting is the process of using microorganisms naturally present in the organic matter and soil to decompose the organic waste in a managed way. Theses microbes need nutrients, oxygen and water for the process of decomposition to make compost as an end product. Compost is dark brown humus like material which can be easily stored and used as a valuable soil conditioner. With the supply of appropriate population of microbes, moisture, surface area, temperature, oxygen, carbon to nitrogen ratio, pH and time, good quality compost can be prepared out of waste. Composting can be done aerobically as well as anaerobically. Composting can be done easily in backyards at household level or even in containers and thus we can also contribute to waste management at individual level.

b) Vermicomposting

Vermicomposting is the process in which earthworms are used in addition to microorganisms for the degradation of the organic waste in managed way under

controlled conditions. It includes vermiculture (means scientific breeding and rearing of specific variety of earthworms *Eisenia foetida* and *Eudrilus eugeniae* in controlled conditions) and vermicomposting (means bioconversion of organic waste materials through earthworm consumption. Vermi-compost is a stable fine granular organic matter that improves the physical, chemical and biological properties of soil in the long run on repeated applications. Vermicomposting is fast, cost effective and sustainable method of organic waste treatment. Vermicomposting can be helpful in generating revenue even if at small level but it may provide employment to rural people thus involving the people at gross root level in waste management.

c) Farm yard manure

Farm yard manure is the decomposed mixture of cattle dung and urine with straw and litter used as bedding material and residues from the fodder fed to the cattle. Manure is organic matter which can be used as organic fertilizer in agriculture to enhance the fertility of soil. Further farm yard manure can of different types like animal manure, human manure and green manure. But animal manure and human manure can prove to be effective tools in managing the organic waste derived from animals and humans like excreta. This can prove to be best method of waste management in rural areas by involving the waste generators in waste management that too with the profit of getting good quality manure for their fields without paying a penny.

Solutions to Non-Biodegradable Waste:

d) The four R's

Refuse: refuse to buy things that you do not really need. Refuse the plastic carry bags offered by the shops instead take your own cotton bags to the market and grocery store. Minimize buying heavily packed items.

Reduce: extend the life of your gadgets by upgrading them if possible. Ensure effective preventive maintenance, proper handling and timely repairs.

Reuse: reuse every possible item at home like paper; plastic bags, cards, envelopes, wood etc. buy food items in reusable or refillable containers. Buy rechargeable batteries if you can afford them. Donate old clothes, books, used electronics etc. to NGO's for refurbishing and reuse.

Recycle: do not throw away the E-waste, plastic and other toxic material like batteries; thermometers into the garbage instead take them back to the manufacturers or to responsible recyclers. Buy recycled products.

e) Up-cycle

This is a creative way to reduce the waste and is trending now-a-days. It includes reusing in a way so as to create a product of higher quality or value than the original, into something useful and often beautiful like turning old clothes into cushion covers and floor mats, tin cans into storage containers or pen stands, paper into flowers etc. up-cycling is proving to be a more efficient way of managing waste than recycling

because later includes breaking down of waste material so that the base material can be remade into a new consumer product often of lesser quality whereas former method does not break down the waste material but includes refashioning it making the up-cycled item a little better or of same quality as the original.

Managing Waste at Final Disposal

By taking above measures religiously waste for the final disposal can be reduced to a greater level but waste management does not stop here still the waste is to be managed at disposal site. It can be done easily by methods like:

a) Sanitary landfill

It is the process by which solid waste are placed in an engineered sanitary landfill designed and operated to minimize public health and environmental impacts. In landfilling the solid wastes are compacted and spread in thin layers and each layer is further uniformly covered by a layer of soil with a final layer of about meter of earth at the top so as to prevent the rodents from borrowing. Bacterial decomposition inside the landfill releases inorganic constituents like CO_2, CH_4, NH_4, H_2S and H_2O which can be harnessed as renewable sources of energy. Properly done landfilling does not cause any environmental damage or air pollution and if the leachate from the waste is collected pollution of surface and underground water can also be prevented.

b) Incineration

It is the process designed to reduce waste to simple solid and gaseous residues. It also reduces the volume of waste so that less land is required for final disposal. But there are few drawbacks also that incineration leads to serious air pollution so proper control and equipment need to be installed to avoid contamination of environment like the heat generated can be utilized in generating steam to run turbine or as waste heat boiler. Incineration can be more efficiently used in treating organic waste as compared to inorganic waste.

c) Pyrolysis

It is the irreversible chemical change brought about by the action of heat in absence of oxygen. It is an endothermic reaction and heat must be applied to waste to distil volatile components. Pyrolysis is carried out at 500-1000 C and final products of the reaction are syngas, liquid and char which are useful because of their high calorific value. The syngas may be treated in a secondary combustion chamber, flared and partially condensed. This syngas can be used in a boiler to generate steam for power generation and as fuel in a dedicated gas engine.

d) Gasification

It is partial combustion of organic carbonaceous material, plastics into carbon monoxide, hydrogen, carbon dioxide and methane. The process is largely exothermic but some heat may be required to initialize and sustain the gasification process. The syngas produced have Net Calorific Value (NCV) of 4-10 MJ/Nm^3. Syngas is also

named as wood gas, producer gas, town gas, generator gas and others. Gasification can recover the energy locked in biomass and municipal solid waste converting these materials into valuable products and eliminating the need for incineration or landfilling. Metal and glass should be segregated from waste stream prior to being sent into the gasification process.

3. Some Waste Management Studies on the Condition of Municipal Solid Waste in India

Improper management of solid waste has been reported by several researchers in different cities of developing countries all over the world (***Mohanty et al., 2014; Das and Bhattacharya, 2013; Noorjahan et al., 2012; Jafari et al., 2010; Chatterjee, 2010; Imam et al., 2008; Chung and Carlos, 2008; Berkun et al., 2005***). In the current paper we are going to review the status of solid waste management in Jammu and Kashmir. The newly formed UT, erstwhile State, may have started to walk on new path of development but solid waste still comes along as problem yet to be considered seriously and its management to be brought to a desired state. In present paper, an attempt has been made to provide a comprehensive review of Municipal Solid Waste Management for Jammu and Kashmir to evaluate current status and identify the problems in this field. A review of literature of SWM in India highlights the importance of segregation for successful operation of waste management facilities (***Gupta et al., 2015***). ***Wahied et al., 2020*** in his study on solid waste management in Doda region of Jammu and Kashmir found urbanization exceeding the carrying capacity to be a main cause of problem related to waste management in the region leading to public health crisis. Another study focused on impact of solid waste due to non-engineering and non-scientific disposal concluded that improper management of waste especially excreta and other liquid and solid waste from households and community are a serious health hazard and lead to spread of infectious diseases (***Pervez and Kafeel, 2013***).

Sharma (2008) worked on the generation of solid waste in Sanjay Nagar area in Jammu city and noticed that the total waste generated per day was 38.79 kg, out of total solid waste biodegradable waste was 29.44 kg, non-biodegradable was 9.21 kg and inert material was 0.146 kg. **Wani and Ahmad (2013)** observed the amount of solid waste in Srinagar city, within the urban environment producing anesthetic and unsanitary condition. They found that there were more than 518 solid waste collection sites and dumping sites which were probing to be unsustainable for managing huge solid waste generated from Srinagar city.

Hamid et al (2020) carried out a study to assess the decomposition potential of the efficient solid waste and leachate degrading bacteria. Samples for analysis of various physico-chemical and biological parameters were collected from active cell of Achan landfill site. Based on morphological, biochemical and molecular characterization (16SrRNA sequencing) the efficient cellulolytic bacteria, proteolytic bacteria and hemicellulolytic bacteria were identified. It was concluded that bacterial consortium

can prove to be helpful in degradation of the biodegradable municipal solid wastes by producing quality compost which could be used as fertilizer for agricultural applications converting the waste into useful resource. Further, these can be used for treatment of landfill leachate as well as degradation of organic solid waste in many environmental settings.

A study on management of financial resources in Municipal Corporations of Jammu and Kashmir by **Ganaii** (2009), to probe out the financial health/position of the Municipal Corporations in the state, gave the results that the financial position of the Municipal Corporations in the state of J& K is far from satisfactory. These Municipal Corporations suffer from huge deficit on revenue account which is funded by the state Government through the mechanism of grants-in-aid. The all India average of per capita own source revenue of municipalities was recorded at Rs. 482.14 as on 2001-02. On the other hand, the per capita own source revenue of the m municipalities in the state as a whole was recorded at Rs. 48.18. However, at the individual Municipal Corporations level, the position of JMC is comparatively better than the SMC.

There has been a significant increase in MSW (municipal solid waste) generation in Srinagar in the last few decades. This is largely because of rapid population growth and economic development. Municipal solid waste (MSW), commonly known as trash or garbage is a waste type consisting of everyday items we consume and discard. It predominantly includes food wastes, yard wastes, containers and packaging materials, and other miscellaneous inorganic wastes from residential, commercial, institutional and industrial sources (***Bhoyar et al, 1996***).

Qazi (2019) has studied the Total Quality Management aspects related with Jammu Municipal Corporation (JMC) and Srinagar Municipal Corporation (SMC) and its impact on other variables such as Knowledge Management Initiatives and Organizational Innovation Performance. The impact of Knowledge Management level of employees of JMC and SMC was tested on their Total Quality Management Principles and Organizational Innovation Principles and the findings revealed that JMC is having a good mechanism for Knowledge Capturing and Storage and SMC struggles in various parameters but someway manages to maintain a satisfactory situation in knowledge creation and storage criteria. In case of Key Performance Results JMC possess key performance concepts but still results in weak situation in Key Performance Results and SMC lacks results in efficiency thus making a weak situation in SMC as well.

Kumar (**2013**) studied the problem of municipal solid waste management in the Faridabad city and to identify the relationship of population parameters and residential pattern with solid waste generation. Result from the surveys showed that higher income group people generate more waste (about half a kilogram/capita/day) in comparison to the low income group. Proximity analysis calculates the moisture content in solid waste and moisture content is the key factor which helps in identifying method of composting of solid waste. General acceptance level of moisture content remains 45-50 percent in solid waste but the moisture content in Faridabad waste was

only 25 percent which shows that waste can be composted easily. Also, smaller the particle size, the more rapid rate of the composting or degrading of waste. The suitable size of the waste particle varies from 13 mm to 50 mm and it was found that 61 percentage of particle size of MSW at Faridabad was of 13.2 mm.

Dar (**2018**) in his study on urbanization in Jammu found out that unexpected shift from agricultural and rural based economy to industrial and urban-based economy in Jammu has brought an overabundance of new problems of civic, social and economic nature. Unscientific method of solid wastage collection and disposal creates many problems in the city. The main source of solid waste in Jammu comes from households, institutional commercial establishments, and industrial operations and in few tourist places, tourist may also be considered to some extent as a source. I In general, in Jammu, solid waste contains putrescible organic matter such as kitchen refuses, combustible matter such as paper, textiles, on and grease and plastics and insert materials such as metals, soil and ash. The waste generated from hospitals, dumping of wastes and feces in drains/canals have greater potential for causing epidemics in Jammu.

Bhat et al., (2014) carried out a study at Yusmarg, a forest ecosystem and tourist resort, in the Kashmir valley with the objectives of determining the municipal solid waste (MSW) generation rates per capita and on a daily basis, and assessing the existing MSW system. It was estimated that daily generation of MSW at Yusmarg by tourists, as well as residents, was 107.74 kg; on average, the MSW generated at each site was about 36.48 kg/day. The per capita generation of MSW was highest (0.97 kg/person/day) at site 1 followed by 0.288 kg/person/day at site 2 and 0.201 kg/person/day at site 3, with an average per capita MSW generation rate of 0.484 kg/person/day. Among the different waste categories, 56% of waste was recyclable materials, 29% was compostable wastes, 9% was combustible wastes and 6% was inert materials. The present study infers that MSW management in Yusmarg was inappropriate, and infrastructure, skilled manpower and a proper scientific disposal mechanism is lacking in the area. In order to conserve the forest wealth of the area there is a great need to focus on the solid waste problem of the tourist resort.

Khan (**2014**) carried out study on solid waste management practices in operation including manpower, organization and maintenance, generation, nature, composition, collection, transfer and transportation, processing/disposal of MSW and selection of viable alternative strategies for modernization of MSWM in the Srinagar city. Thus came up with the results that Srinagar City generates large magnitude of waste. Srinagar Municipality is able to take care of 72.07 per cent of waste daily rest remains unattended or unauthorized disposed in open spaces, depressions, nallahs, water bodies. This inadequacy in the Management of Solid Waste has generated a lot of problems which have inflicted irretrievable damages to the environment and declined sanitation condition of the city.

Balwan et al., (2020) conducted a study on waste management in the doda region of Jammu and Kashmir and came up with the results that High standards of living of ever-increasing population have resulted in an increase in the quantity and variety of waste generated, particularly in urban areas. It is now being realized that if waste generation continues recklessly at this very pace, then it would become rampant and alarming very soon and possibly beyond rectification. **Rasool and Balwan** (2020) in a similar study on generation and composition of MSW from commercial area of Janipur, Jammu came up with the conclusion that main management strategies should include amendment of current management laws, improvement in current management system and introduction of classified collection. The solid waste generated in the study area can be utilized in the production of manure and energy which will help to reduce the volume of solid waste and to some extent also reduce the increasing stress on natural resources by meeting the power needs of the people of the area to some extent.

Kumar and Singh (2013) carried out a study to estimate qualitative and quantitative composition of domestic solid waste in the semi urban area of Kathua district of Jammu, Jammu and Kashmir, the study also focused on comparative account of relationship between the domestic solid waste generation and the educational level of the family (Head of the family). They came with the findings that People collected solid waste in plastic bags or dustbins and dispersed it in open or in drains. Sweepers were engaged for sweeping the lanes and streets, recyclables were also collected by rag pickers. The most of the waste generated was stored in the vacant plots or along the road side. Open vehicles or tricycles were used to transport solid waste from different places to site of disposal. Nearly 75-80% of the waste was sent to open dumps near the bank of river Ravi where its open burning was carried out.

Waste stream, the term describes continuous flow of various kinds of waste produced by human beings including domestic, industrial, commercial and construction refuse. The most common way of disposing the waste is simply putting it away somewhere in open in the form of giant piles that gets exposed to winds, rain, rats, flies and other animals. As the waste decays it releases odour and airborne pathogens along with release of toxic fumes and spread of hazardous gases in the air when this solid waste is burnt.

Table No.1: Solid Waste Classification According to Sources in the Community

Sources	**Typical facilities, activities or locations where waste are generated**	**Types of Solid wastes**
Residential	Single-family and multifamily dwellings; low-, medium-, and high-density apartments etc	Food waste, paper, cardboard, plastics, textiles, leather, yard waste, wood, glass, tin cans, aluminium and other metals, ashes

		street leaves, special waste (including bulky items, consumer electronics, white goods, yard waste collected separately, batteries, oil and tires) and household hazardous wastes.
Commercial	Stores, restaurants, markets, office buildings, hotels, motels, print shops, service stations, auto-repair shops etc	Paper, cardboard, plastics, wood, food waste, glass, metal waste, ashes, special waste, hazardous wastes etc.
Institutional	Schools, hospitals, prisons, governmental centres etc	Same as for commercial
Industrial(non-process waste)	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants , power plants, demolition etc.	Paper, cardboard, plastics, wood , food waste, glass , metal waste, ashes, special waste, hazardous waste etc.
Municipal solid waste*	All of the preceding	All of the preceding
Construction and demolition	New construction sites, road repair, renovation sites, razing of buildings, broken pavements etc.	Wood , steel , concrete, dirt etc.
Municipal services (excluding treatment facilities)	Street cleaning, landscaping , catch – basin cleaning, parks and beaches, other recreational areas etc.	Special wastes , rubbish , street sweeping, landscape and tree trimming, catch basin debris, general wastes from parks , beaches and recreational areas.
Treatment facilities	Water, waste water, industrial treatment processes etc.	Treatment plant waste principally composed of residual sludges and other residual materials.
Industrial	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants , power plants, demolition etc.	Industrial process waste, scrap materials etc ; non-industrial waste including food waste , rubbish , ashes, demolition and construction waste , special waste and hazardous waste.
Agricultural	Field and row crops, orchards, vine yards, dairies, feedlots, farms etc.	Spoiled food waste, agricultural waste, rubbish

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Vol. 9 Issue 01
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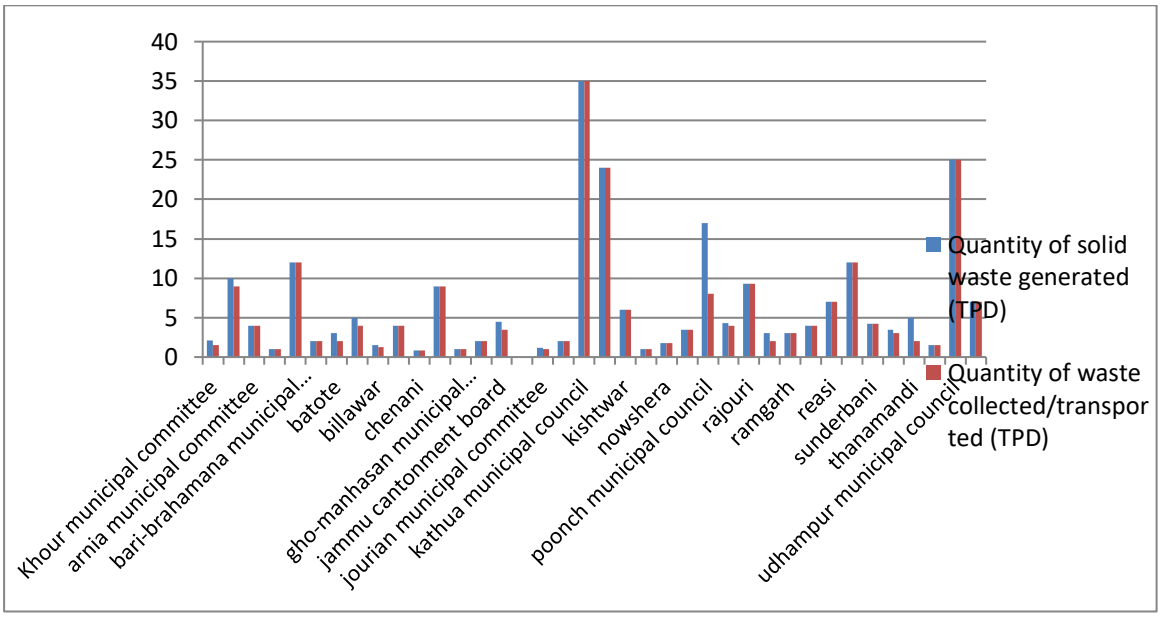
		and hazardous waste

Source- Compiled from (Tchobanoglous & Kreith, 2002) study. *The term municipal solid waste (MSW) is normally assumed to include all the waste generated in a community, with the exception of waste generated by municipal services, treatment plants, industrial and agricultural processes.

Table No.2: Municipal Solid Waste Generation Rate in Jammu and Kashmir

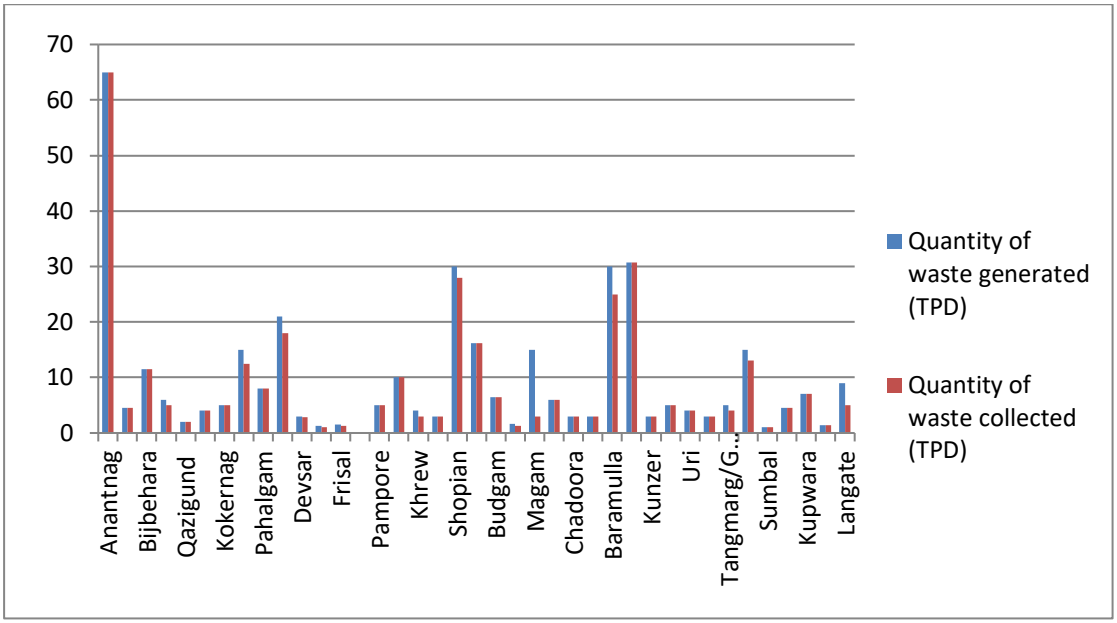
Abstract				
Name of the province (J&K UT)	Generation (TPD)	Collection (TPD)	Treated (TPD)	Untreated (TPD)
Jammu	692.16	673.40	79.19	612.97
Kashmir	826.75	791.25	461.00	365.75
Grand total	1,518.91	1,464	540.19	978.72

Source: PCB/T/C/Annual report/2019-20/MSW/‖/EE/68/508-12 Dated: 01-09-2020



Source: PCB/T/C/Annual report/2019-20/MSW/‖/EE/68/508-12 Dated: 01-09-2020
Fig: ULB's looking for waste generation and collection rate (TPD) in Jammu division (2019-20)

International Journal of Research (IJR)
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Vol. 9 Issue 01
January 2022



Source: PCB/T/C/Annual report/2019-20/MSW/‖/EE/68/508-12 Dated: 01-09-2020
Fig: ULB's looking for waste generation and collection rate in Kashmir division 2019-20

Table No. 3: Municipal solid waste treatment processes in Jammu and Kashmir

Composting		
Setup	**Operational**	**Under Installation**
Jammu: 01 Jammu cantonment board	**Jammu: Nil**	**Jammu: planned for cantonment board Satwari (civil pocket)**
Kashmir: 03 Srinagar MC, MC Pahalgam, MC Tangmarg/ Gulmarg	**Kashmir : Srinagar MC and MC Pahalgam**	**Kashmir: DPR for settling up integrated solid waste management cluster approved by State Level Apex Authority**
Vermicomposting		
Setup	**Operational**	**Under installation**

.Jammu Division - 3 No MC Bhaderwah, MC Doda and MC Sunderbani	**Jammu: 02 MC Bhaderwah and MC Sunderbani**	**Planned for Udhampur, Reasi and Katra**
Biogas		
Setup	**Operational**	**Under installation**
Jammu: 02 Mule dung based plant at base camp SMVDSB Katra, 06 cu m biogas plant at cattle pond Dogra hall	**Jammu: 02 Mule dung based plant at base camp SMVDSB Katra, 06 cu m biogas plant at cattle pond Dogra hall**	**Nil**

Source: PCB/T/C/Annual report/2019-20/MSW/‖/EE/68/508-12 Dated: 01-09-2020)

Conclusion

Thus, it is clear that the UT is on the way for a better management strategy on papers and some plans have been implemented at ground level too. But is the pace with which the authorities are moving is fast enough to cater the problem that is increasing by many folds with each passing day and implementation of the initiatives and schemes at gross root level is a big question in front of managing authorities and most of the authorities are seemed to bring debacle to the plans. Instead of behaving as a braggart, municipal authorities should try to bring the solid waste management plans to reality at local level with cooperation of locals. Will the handover of erstwhile state in hands of Central government prove to be a better step for development of region, may this question gets its answer very soon in near future because J&K is said to be the crown of India and a crown is embedded with gems of various colors, not with the waste of different kinds. All this demands a serious partnership among the various authorities involved in waste management, along with the contribution from citizens as a part of their duty and no doubt role of educational institutes in bringing up better citizens having a good sense of sustainable development.

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