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# Solid Waste Management: An Overview Study of Kohima Municipal Council

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## Abstract

*Nagaland attained its statehood on 1st December 1963. Kohima is the state Capital of Nagaland. The total population of Kohima according to 2011 census is 267, 988 and 90 percent of the population is predominantly tribal. However, with increasing modern lifestyle and rapid population growth resulted in the increase in the quantity and variety of waste generated at urban areas. Urban wastes have become dangerous to human beings in the form of non-biodegradable and harmful materials causing hazards to the society in the long run. Hence, solid waste management is one among the primary essential services provided by municipal authorities in the country to keep the urban centers clean. The objective of the paper is an overview study of Kohima Municipal Council in regard to Municipal Solid Waste Management at the backdrop of Management of solid waste of 2000 & 2006 Rules. Its implementation, strengths and challenges in the city and sensitizing the people on solid waste management have been deliberated in this paper.*

## Introduction

Kohima district was established in 1881 as a Sub-Division of formerly Naga Hills District within Assam. Nagaland attained its statehood on 1st December 1963 and Kohima is the Capital of Nagaland (Balakhrisna, 1961). It lies between 94°5'11" to 94°7'12" East latitudes and 25°28'20" to 25°31'51" North latitudes. It is situated on the Dimapur to Imphal NH 39. The population of Kohima district in 2018 is 305, 089 and 90% are tribal (GoN, 2011).

## Topography

The district is rugged and hilly terrain with mean elevation of the town is 1468 m (ranges from 150m-3000m) and lies in seismic zone V. It is prone to landslides due to heavy rainfall.

## Regional Road Linkages

Three National Highways 39, 61 and 150 are well connected with state capitals of neighboring states.

## Kohima Municipal Council

Kohima Town Committee (KTC) was established in 1957. It was initiated by the concern citizens consisting 8 wards with 8 elected councilors and 4 Govt. nominees. In 2005, Municipality was constituted under the provision of the Nagaland Municipal Act, 2001. At present, there are 19 Wards having one Dipper Truck each and 7 Vehicles for highways transporting solid waste to the disposal sites. Out of 194 staff, 110 are laborers (36 sanitary workers, 74 sweepers and 84 ministerial staff). Kohima town being the administrative headquarters of the state Nagaland, there is an increase of population relocation drawn by economic reasons for trade, commerce, employment and education. The migration of population from villages to towns have led to the rapid urbanization and hence its density of population. According

to 2011 Census, the decadal growth from rural to urban place is 59.87% (Population India, 2018). Kohima town lacks proper town planning and natural topography constraints with heavy rainfall in most parts of the year are major concerns for municipal solid waste management affecting public health hazards and environmental problems, as total elimination of waste is not possible. Therefore, the effective management of solid waste has become a colossal challenge for the Kohima Municipal Council (KMC) for service delivery for better quality life.

## Objective

The main purpose of the solid waste management is to reduce the quantity of solid waste and disposed off on land by recovery of materials and energy requirement of raw material and energy as inputs for technological processes. Solid waste management is one among the primary essential services provided by municipal authorities in the country to keep the urban centers clean. The objective of the paper is an overview study of Kohima Municipal Council in regard to Municipal Solid Waste Management at the backdrop of Management of solid waste of 2000 & 2006 Rules. Its implementation, strengths and challenges in the city on sensitizing the people on Solid Waste Management are discussed in holistic approach in relation to health and ecosystem**.**

## Methodology

For the present study, qualitative methodology was adopted using grounded approach. Both Primary and Secondary sources of data have been used for interpretation. Primary sources data are obtained by using various tools and techniques like household survey, in-depth interviews in the form of informal unstructured questionnaire with key informants like staff and officials of Kohima Municipal Council, community stakeholders, and physical assessment of the implements and

tools used on generation of solid waste, storage, collection and transportation and final disposal of the waste to the sanitary landfill and controlled waste for recycling use. Through the interview the first hand information was garnered. Secondary sources of data were from official records, documents, books, journals and research works.

**Solid Waste Management**:

"Any useless, unwanted discarded material that is not a liquid or gas is referred to as solid waste." (Hosetti, 2006). Solid waste management is one of the most neglected urban services. It has lacked due attention in India and its urban areas. Solid Waste Management (SWM) is one of the important primary services provided by municipal authorities in the country to keep the urban centers' clean. Waste is littered all over leading to unsanitary living conditions. Municipal laws governing the urban local bodies do not have adequate provisions to deal effectively with the ever-growing problem of solid waste management (Ali, 1999).

**Sources of Solid Wastes**

The main sources of solid waste are: Medical Centres, Food Stores, Feeding Centres, Food Distribution Centers, Slaughter Houses, Agency Premises, Markets and Domestic Areas.

**Different Categories of Waste**

Different categories of waste are organic waste, combustible, non-combustible, ashes/dust, bulky waste, dead animals, hazardous waste, construction waste, sewage sludge.

**Types of waste**

There are different types of waste such as residential, commercial, institutional and offices, municipal and agricultural.

**General Methods to Treat Solid Waste (Key Components of Municipal Solid Waste Management (MSWM) 2000 & 2006 Rules):**

Solid waste management can be divided into 5 key components- Generation, Storage, Collection, Transportation and Disposal. (MOUDPA, 2000)

a) **Generation**: Generation of solid waste is the stage at which materials become valueless to the owner and since they have no use for them and require them no longer, they want to get rid of them resulting in waste.

b) **Storage:** Storage is a system for keeping materials after they have been discarded and prior to collection and final disposal. People often store waste before disposal. Improved storage facilities include-
   i) Small containers; household containers, plastic bins.
   ii) Large Containers; Communal bins, oils, oil drums, etc.
   iii) Shallow pits.
   iv) Communal Depots; walled or fenced in areas.

In determining the size, quantity and distribution of storage facilities, the number of users, types of wastes and maximum walking distance must be considered.

c) **Collection**: It simply refers how waste is collected for transportation to the final disposal site. Any collection system should be carefully planned to insure that storage facilities do not become overloaded. Collection intervals and volumes of collected waste must be estimated carefully.

d) **Transportation**: This is the stage when solid waste is transported to the final disposal site. There are various modes of transport which may be adopted and the chosen methods depend upon the availability and volume of waste to be transported.

e) **Disposal:** Solid waste management is safe disposal where associated risks are minimized. Different methods for disposal of solid waste are:

**Thermal Treatment**: This refers to processes that involve the use of heat to treat waste.

i) **Incineration**: This is the most common thermal treatment process. This is the combustion of waste in the presence of oxygen. After incineration, the wastes are converted to carbon dioxide, water vapor and ash. It may be used as a means of recovering energy used heating or the supply of electricity. In addition to supplying energy incineration technology has the advantage of reducing the volume of the waste, rendering it harmless, reducing transportation cost and reducing the production of greenhouse gas methane.

ii) **Open Burning:** It is the burning of unwanted materials in a manner that causes smoke and other emission to be released directly into the air without passing a chimney or stack. This includes the burning of outdoor piles, burning in a burn barrel and the use of incinerators which have no pollution devices and as such release the gases by- products directly into the atmosphere. Open burning has been practiced by a number of urban centers because it reduces the volume of waste received at the dump and therefore extends the life of the dump site. Garbage may be burned because of the ease, and convenience and cheapness. Households are required to pay for garbage disposal, burning of waste in the backyard allows households to avoid paying the cost associated with collecting, hauling and dumping the waste. Open burning has many negative effects on both human health and their environment. The uncontrolled burning of Garbage releases many pollutants into the atmosphere which includes dioxins, particulate method, polycyclic aromatic compounds, volatile organic compounds, carbon monoxide, hexachlorobenzene and ash.

All these chemicals pose serious risk to human health (Jamir et.al, 2011).

**Landfills and Dumps**

i) **Sanitary landfills**: Sanitary/Scientific landfills are designed to greatly reduce or eliminate the risks that waste disposal may pose to public health and environmental quality. They are usually placed in areas where land features act as natural buffers between the landfill and the environment. For instance, the area may be comprised of clay soil which is fairly impermeable due to its tightly packed particles, or the area may be characterized by a low water table and an absence of surface water bodies thus preventing the threat of water contamination. In addition to the strategic placement of the landfill other protective measures are incorporated into its design. The bottom and sides of landfills are lined with layers of clay or plastic to keep the liquid waste known as leachate, from escaping into the soil. The leachate is collected and pumped to the surface for treatment. Boreholes or monitoring wells are dug in the vicinity of the landfill to monitor groundwater quality. A landfill is divided into a series of individual cells and only few cells of the site are filled with trash at any one time. This minimizes exposure to wind and rain. The daily waste is spread and compacted to reduce the volume, a cover is then applied to reduce odours and keep out pests. When the landfill has reached its capacity it is capped with an impermeable seal which is typically composed of clay soil. Some sanitary landfills are used to recover energy. The natural anaerobic decomposition of the waste in landfills produces landfill gases which include carbon dioxide, methane and traces of other gases. Methane can be used as an energy source to produce heat or electricity. Thus some landfills are fitted with landfill gas (LFG) systems to capitalize on the methane being produced. The process of generating gas is very

slow, for the energy recovery system to be successful there needs to be large volumes of wastes. These landfills present the least environmental and health risk and the records kept can be a good source of information for future use in waste management. However, the cost of establishing these sanitary landfills are high when compared to the other land disposal methods (MOUDPA, 2000).

ii) **Controlled Dumps**:

Controlled dumps are disposal sites which comply with most of the requirements for a sanitary landfill but usually have one deficiency. They may have a planned capacity but no cell planning, there may be partial leachate management, partial or no gas management, regular cover, compaction in some cases, basic record keeping and they are fenced or enclosed. These dumps have a reduced risk of environmental contamination, the initial costs are low and the operational costs are moderate. While there is controlled access and use, they are still accessible by scavengers and so there is some recovery of materials through this practice (SSWPU, 2000).

**Recycling**

Recycling refers to the removal of items from the waste to be used as a raw material in the manufacture of new products. Thus, according to this definition recycling occurs in 3 phases;

1. The waste is sorted and recyclables are collected,
2. The recyclables are used to create the raw materials then,
3. These raw materials are used in the production of new product.

The sorting of recyclables may be done at the source (within the household/office) for selective collection by the municipality or to be dropped off by waste producer at cycling centres. The pre-sorting at the source requires public participation which may not be forthcoming.

The sorting of the municipality has the advantage of eliminating the dependence on the public and ensuring that recycling does not occur however it is disadvantageous because of the fact that value of the recyclable materials is reduced, since being mixed with other garbage can have a reverse effects on the quality of the recyclable materials (PIUMINE, 2009).

## Observation & Findings

Municipal waste Management in Kohima reveals some major findings of strength and deficiency in managing activities related to waste generation collection, storage, transportation, processing and disposal of wastes in adopting the principles of economy, aesthetics, and conservation of energy and environment.

*i) Waste Generation and Collection:*

Kohima produces 90 metric tons of waste per day. The waste is mostly dry (non biodegradable) and wet waste (biodegradable). There are 19 wards/sanitation committees with 82 pickup/ collection points of waste in Kohima.

At present there are 2 kinds of waste bins that are used to collect waste – **Green** for biodegradable waste and **Blue** for non biodegradable waste. In future it intends to introduce two new bins i.e. Orange bins for electronic or e waste and Black bins for hazardous wastes.

## Processing and Disposal of Solid Waste

*1. Kohima Demo Project:*

The first major project by KMC started in 2006 in collaboration with Nagaland Pollution Control Board (NPCB) and Central Pollution Control Board (CPCB). KMC purchased two mini –Dipper trucks, 1 Excavator (JCB), 2 Tata Mobile for Bio-Medical Waste, Push Carts for rag pickers, pamphlets, sanitary equipment and free distribution of about 18,000 bins to colonies,

schools colleges, Govt. institutions. It set up a mini landfill at Viyakhukie (above Phek Road) 16 kms away from Kohima.

*2. Vermi Compost Plant:*

Organic Composting of Vegetables or green waste generating power and gobar gas for domestic fuel. The objective is to create awareness in maintaining better waste management at primary household levels and experiment with other ways to recycle waste to wealth. At present vermin compost is set up near the landfill at Lerie colony, these vermi manure is sold at Rs. 6 per Kilogram to the individuals.

3. *Decentralization:*

KMC is one of the first cities in India to initiate decentralization of solid waste management service since 2011; it involves the community role and participation by creating awareness through the panchayat, youth, women's organization, in managing their own waste at household level. Out of 19 wards 10 wards practiced decentralization of solid waste management. However, only 2 wards actually showed positive participation in disposal of solid waste management. Therefore, greater involvement and participation is felt by sensitizing the public at a base grassroots level through different medium (Ali, 1999).

*4. Transportation:*

Solid waste is collected by individual household at a designated place to the dipper truck at 5:30 AM from Monday to Saturday, except on Wednesday and transported to processing sites/disposal sites. The household pays Rs. 70 per monthly. Transportation system involves minimum manual handling and exposure to the waste and processing of waste.

**New Projects in Progress**

1. A mega 50 crores project for scientific landfill at Lerie

colony was commissioned at 11th February 2016. Here, the waste will be scientifically monitored by segregating waste, sewerage treatment, air monitoring and other methods. The landfill is earmarked for 25 years but if the community reduces –reuse-recycle and segregate our waste from household levels the life of the landfill can be prolonged.

2. One incinerator unit for bio-medical waste is on the pipeline.
3. One crematorium for the Hindu community.
4. Septage Management treatment plant to tackle the menace of septic tanks scientifically at Dzuruzou 14 kms from Kohima.
5. Plan to set up a modern slaughter house; meats to be distributed will be monitored before distribution.
6. In the near future, plans to introduce a willy bins fitted with tracking chips. These chips will send alert signals to KMC office to empty it when it is filled. Similar mechanisms for monitoring trucks carrying waste to check workers on duty.

**Activities of KMC**

*i) Safety measures for workers:*

a) The employees working in the KMC are given protective gear like hand gloves, boots, masks, raincoats while working and handling the waste to be disposed off.
b) Free medical checkup for various diseases and tetanus injection administered. KMC is affiliated with some private and govt. hospitals that provide treatments to these workers.

*ii) Awareness month:*

The month of May is declared as SWM Awareness since 2010. Mass Social works, awareness seminars are organized in the colonies.

*iii) Award for best inters ward cleanliness:*

In order to encourage the wards and to create a general awareness

among the public the award was constituted in 2011. Every year the award is given to the cleanest ward with a certificate, cash and running trophy to the best three wards.

**Risks, Diseases and Challenges**

**Impact of improper waste management:**

*a) Increase disease transmission that threaten public health:*

Rotting organic material pose great public health risk, they serve as a breeding ground for diseases. Waste handlers and pickers are venerable and may become the vectors, contracting and transmitting various diseases and spread to other people.

*b) Create greenhouse gas emission and other pollutants:*

The organic waste disposed off on an aerobic degradation give out methane-a gas 21 times the effect of carbon dioxide in trapping heat (Smith et al., 2012). Garbage on burning emit out pollutants which pollute the air and the environment.

*c) Damage ecosystems:*

When solid wastes are dumped into rivers and streams they alter aquatic habitats and harm nature, plants and animals by depleting the dissolved oxygen in water. They also contaminate ground and surface water, some of the water samples collected showed low pH value indicating the corrosive nature of this water samples which may be due to the presence of toxic metals such as Pb and Cu. (Kibami et al., 2014), **(Smith, 2011)**, (Jamir et al., 2011). Moreover, the accumulation of these solid wastes may present physical hazards, clog drains and cause localized flooding.

*Fund Constrain*

Under the 12$^{th}$ Schedule of the 74$^{th}$ Constitutional Amendment Act, it states about the powers and functions of the Urban Local

Bodies (ULBs) (Suponglila, 2015). However, the State Govt. failed to conduct elections to the ULBs as a result the central funding ceased since 2017. KMC generates its own revenue through toll taxes and duties on goods and services, with little financial assistance from the State Govt. Hence with constraint resources it shoulders the herculean responsibility of city beautification and developmental tasks and also an attempt to tackle the challenges of solid waste management. Environmental problems concerns all the people in the community, however environmental problems are certainly not an issue competing for attention that has been witnesses in developing countries, since resources are limited, decisions are more difficult to mitigate the problem with solutions.

*e) Media Coverage:*

Media has played an important role in any successful struggle by the communities in general and various individuals, organizations and nongovernmental organizations and the media in particular in addressing environmental related issues and activities. It is witness that the role played by media inspire other communities as media plays the dual role in informing and publicizing the communities about the environmental pollution, however, the media has failed several times to effectively analyze the situation and give a follow up action of the project and schemes.

*f) Academic and Research Organization:*

Research institutions and academics plays a significant role in addressing environmental issues, their role is not only to help the community and NGOs to create awareness on environmental related issues but by being proactive in monitoring the state of affairs. Research communities and aided non governmental agencies should publicize their reports and make it easy access in the public domain for greater awareness and civic sensitivity, it is observed that learned intellectuals and institute of higher

learning have better access to information but they have apathy attitude and lacks social ownership ethics that clouts their decision making. Moreover, there is a lack of coordination at different levels; the government, higher learning institutes, civil societies, non-governmental agencies and communities in State Policy making in Nagaland context.

**Recommendations and Conclusion**

Kohima Municipal is still in its nascent and transitional stage and is yet to be full-fledged Municipality. Marked quality improvement of KMC in service delivery in regard to MSWM was observed over the years. However, the areas in which they have to work on are; i) Lack of basic health facilities and amenities to workers. ii) Under staffing of labor and staff at KMC. iii) Tools, vehicle for waste transportation and disposal is insufficient. iv) Lack of proper incineration to treat biomedical waste. v) Mechanized containers should be used to enhance storage capacity. vi) Kohima being the hilly terrain picks up points of collection and disposable of waste should be users friendly by proper route planning. vii) Lack of civic sense by the public and various stakeholders in treatment of solid waste management at source point. Therefore, capacity building programme should be organized often. vii) The state govt., the Kohima Municipal Council, the aid agency must make its research findings and reports should be made easy access in the public domain. viii) Wide media publicity and follow up developments to inform and educate the public on environmental problems. ix) School syllabi and curriculum should be design to educate the students at tender age to inculcate civic sense and sense of social ownership in addressing different aspects of environmental issues. x) Proper coordination in policy making with stakeholders is recommended. xi) Financial constraint was the major hurdle in slow development and performance of waste management. Therefore it is imperative for the state Govt.

to ensure for the conduct of urban local bodies election at the earliest for smooth functioning of Municipalities.

Therefore, in articulating a sense of environmental concern on its issues and challenges a rethinking by the state and the stakeholders in particular and the citizens in general, efforts should be to work on sustainable system in disposing wastes in an environment friendly and economically viable, socially acceptable way of the municipality.

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