

Solid Waste Management Practices and it's Rising Problem in Gangtok Municipal Areas

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Abstract

Urban areas across the nation have been facing a serious problem of solid waste and with the growing problem, urban bodies have been trying its best to address the issue. My paper attempts to understand the role of Gangtok Municipal Corporation (GMC). The best of practices GMC has been playing for the collection, transportation and disposal of solid waste, how its working with the collaboration to different Non-Governmental Organisations (NGO's), local people participation in handling waste and its consequent effect on the environment. The study was carried out by using quantitative research design, employing group discussion and in-depth observations methods with all the stake holders such as GMC officials, workers, NGO's and households. The study finds that the primary focus of the corporation remains on collecting and transporting largely unsegregated mixed waste from the main roads, markets, and other visible places. Although the corporation is working along with different NGO's, it is struggling to implement the SWM rules and failed to collect the user fees efficiently, my findings suggest that even though majority of the people are aware of the ills of burning and dumping garbage, yet people's participation in SWM related activities is limited.

Keywords: Urban area, Gangtok Municipal, Waste Management, GMC, SWM rules

Introduction

The swift urbanisation in developing nations has resulted in a substantial increase in waste generation, overwhelming local governments (Ahmad khan & Naeem Ur Rehman, 2009). Unlike developed countries, which have robust waste management systems, developing nations face significant challenges in handling waste, posing environmental and health risks (Adedipe, Sradhar, Baker, Verma, Faruqui, & Wagner, 2005). This study examines the MSW issue and prospects in Gangtok city, a concern that echoes globally.

Objective

- To study the impact of solid waste and its rising problem in Gangtok Municipal Corporation
- To Study the short term and long-term effect of Solid waste management in the livelihood of the people and environment of Gangtok

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- To emphasize the adoption of new initiatives for improved solid waste management practices.

Literature Review

Solid waste management is vital for urban sustainability, ensuring environmental protection and public health. Inadequate waste management can have severe consequences (Thailand Environment Monitor, 2003). Developing countries in Asia face significant solid waste challenges due to rapid urbanisation and industrialization, highlighting the need for effective waste management strategies to support economic growth and environmental well-being (Zhu & World Bank, 2007).

Research Methodology

This research utilizes a qualitative methodology, integrating a thorough examination of existing literature and case studies to assess the present condition of solid waste distribution and its effects on the environment and public health.

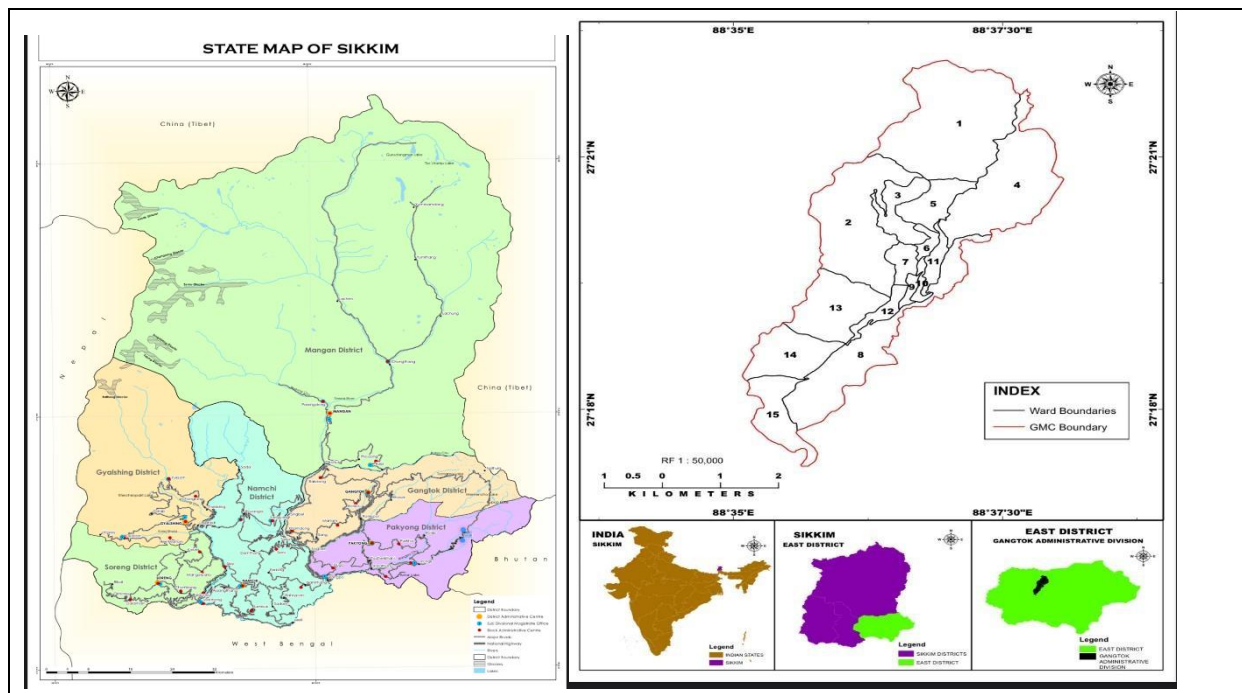
Study Area

Gangtok, Sikkim's capital, is a fragile hill city situated at 1,650m elevation, with a population of 100286 (census 2011) and spanning 19km/sq. the city's rapid urbanisation, tourism-driven economy, and challenging terrain-driven economy, and challenging terrain make municipal services, particularly solid waste management, complex. The Gangtok Municipal Corporation, established in 2010, oversees waste collection, transportation, and disposal across diverse wards with narrow roads. These physical and administrative constraints are key to understanding the city's waste management challenges.

Gangtok's solid waste management (SWM) system faces significant challenges, including inadequate segregation at source, underutilized composting capacity due to mixed waste, and seasonal waste spikes from tourism. The Martam disposal site, located near the Rani Khola River is operationally constrained and not designed as a sanitary landfill, leading to open dumping and leachate issues, exacerbates environmental concerns, including microplastic pollution in nearby rivers and high-altitude ecosystems.

The boundary demarcation proceeds as: eastward along Eastern Bypass Road to Maney Jhora, the upstream along Maney Jhora, then upstream along Maney Jhora and PHE pipeline road to zoo boundary near Hanuman Tok. It then traverses along the ridge and descends to the first turning, proceeding along Hanuman Tok link road to the 2nd Mile Check Post. From there, it runs diagonally downhill to Dichilling Jhora and continues downstream to a point 300 feet below Rongnek Road.

FIG. 1. Location Map



Source: Map prepared by the Research Scholar

Table 1. Details of Gangtok Municipal Cooperation

1.	Formed	in May 2010
2.	Population	1,00,286 (census 2011)
3.	Area	19.016 sq. km
4.	Municipal Wards	17
5.	Boundary	Tashi view point upto Ranipool
6.	Gangtok Municipal Cooperation is one of the youngest & smallest corporation in India	

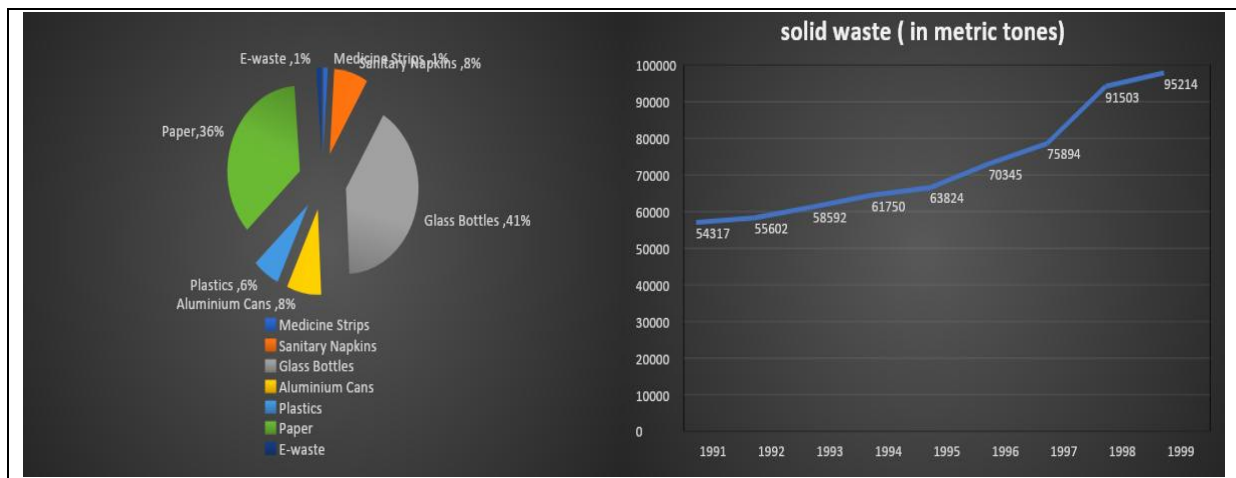
Source: G.M.C Sikkim

Waste Generation and Characteristics

The solid waste generated in Gangtok includes household waste, commercial waste, construction debris, street waste, and more. Around 45 metric tons of waste per day are produced in Gangtok and its surrounding areas. Among these, domestic waste is the largest contributor at 34.19%, followed by commercial and institutional waste at 28.1% and 19.2% respectively. Agricultural waste accounts for 31.7% while industrial and other waste make up only 0.12% and 15.22%, respectively. Gangtok produces approximately 27,000 kg of municipal waste daily, with a per capita solid waste generation of 0.385 kg/day, as reported by Department of Urban Development. Household waste, including kitchen scraps like vegetable peels, metals, plastics and bottles, is the primary contributor. Additional sources include institutional waste from schools, college, offices, banks, hospitals, and religious sites, which generate leftover food, plastics, paper and even human excreta. Commercial waste from hotels and restaurants comprises food preparations residues, ashes, spoiled dairy items and discarded goods. Agricultural waste originated from dairies, poultry farms, and cattle farms including

animal excreta. Other bio-degradable waste includes roadside tree leaves, branches and similar materials (Sharma R, 2019).

Figure. 2. Non Bio degradable Waste, Sikkim and total waste collected 1991-1999



Source: SPCB, Government of Sikkim

Current Solid Waste Management Practices.

Sikkim's challenging terrain and ecological sensitivity make resource mobilization and solid waste management complex despite coordinate efforts. Limited land availability and the demands of tourism and socio-economic activities further highlighting the need for efficient waste management solutions. The challenging terrain and topography of Gangtok make waste collection, transportation, and segregation difficult for workers, especially during the monsoon season. Narrow village roads, clustered settlements, and areas with poor drainage worsen the situation, with landslides and waterlogging further complicating transportation and waste handling. Open garbage trucks and rain soaked waste add to difficulty, making segregation unmanageable. Additionally, poorly planned waste management strategies contribute to inefficiencies. Gangtok relies on a compost plant at Martam, located 18km away, which processes around 50MT/day of organic waste. The site situated near Rani Khola and NH31A Now NH10, is surrounded by forests, agricultural lands, and scattered housing, raising concerns about its environmental impact.

Waste collection, storage and transportation are key components of Sikkim's solid waste management system. While households are provided with separate bins for biodegradable and dry waste, mixed waste is often openly burned, a common but harmful practice. Improving waste collection and transport systems in Gangtok and nearby areas could address these issues. Currently, 80% of the landfill site is already filled, and at this rate, it will only last for another three years, potentially leading to a major waste management crisis in Gangtok.

The solid waste management system in Sikkim is in its infancy, according to the GMC Commissioner. Proper infrastructure is needed for responsible waste disposal. Currently, the waste collection system and landfill site aren't receiving segregated waste from residents, highlighting the need for a well-designed waste management framework to protect public health and preserve the state's ecological assets.

Table 2. Landfill Area Cover under Gangtok

No of landfill	Total area under GMC	Area under landfill	Address	Landfill Coverage as of now
1	4.6 hectares	1hectare approx.	East Sikkim (Martam)	80% of landfill area already used.

Source: Sikkim Chronicle, 2019

Landfill

Gangtok's waste, totalling around 14,600 MT annually, is dumped at the Martam compost plant, located 18km away. However, the plant, designed to handle only 50 MT/day, is struggling due to poor waste management, manual segregation with insufficient workers, and equipment issues. Despite being intended to last 15-20 years, the site is already facing significant challenges due to the increasing volume.

The landfill near Gangtok, originally at deteriorating due to the unregulated dumping of untreated hospital and pharmaceutical waste, posing significant health and environmental risks. Nearby villages, including Lower Martam, 14th Mile, Nimtar, and Mangthang, are severely affected, reporting foul odours, breeding pests, and toxic leaks. Residents have experienced a rise in health issues such as lung cancer, tuberculosis, skin infections, allergies, and other serious ailments, with TB cases notably increasing.

Figure No.2. Landfill site at Martam, Gangtok



Source: Source: Map prepared by the Research Scholar

The Martam Landfill is divided into different zones:

1. Dumping Yard: Currently used for waste disposal
2. Yard 2: Reserved for future excess dumping.
3. Servicing Area: Manages waste collected in dumping zone.
4. Filter Panel: A ventilation system that removes water content and filters waste to prevent it from entering the main drainage system (Rani Khola).

Initiatives taken by Government of Sikkim

To manage solid waste, Government of Sikkim has taken following initiatives:

1. Banning plastic bags in the state.
2. Implementing rules in 1997 to reduce, reuse, and recycle biodegradable waste with penalties for improper disposal'
3. Setting up compost plants in Martam and kunchenzonga vegetable market to process waste.
4. Providing color-coded dustbins to households and establishments in municipal areas.
5. Prohibiting disposal items like packaged water bottles, flex banners, and burning of agricultural waste, leaves and trash, as per Notification No. 196/FEWMD dated 5/1/15.

Sikkim pioneered India's plastic ban movement, prohibiting disposal plastic bags in 1998 and single-use plastic water bottles in government events and offices by 2016. The state government also banned Styrofoam and thermocol products. This initiative started in Yuksom, a village near Khangchenzonga National Park, where locals and Khangchenzonga Conservative Committee (KCC) worked together to reduce plastic waste. The KCC collected 800 kg of waste and promoted biodegradable alternatives. Sikkim now uses biodegradable plates and reusable water bottles in official events. However, enforcing the ban remains challenging, especially with e-commerce and electronic products wrapped in plastic. The state is working to raise awareness among the tourists, drivers, and hotel owners to reduce plastic use. Organizations like WWF and Swachh Bharat Campaign are collaborating with the government to achieve zero waste in the Himalaya region.

State Green Policies

- Ban on packaged drinking bottles
- A day Mother Earth
- Sikkim as Air Pollution Control Area
- Sikkim Idol Immersion Rules, 2019
- Declaration of No Horn Zones
- Ban on Pet Coke and Furnace Oil as Fuel in Industries.
- Ban on burning of tyres

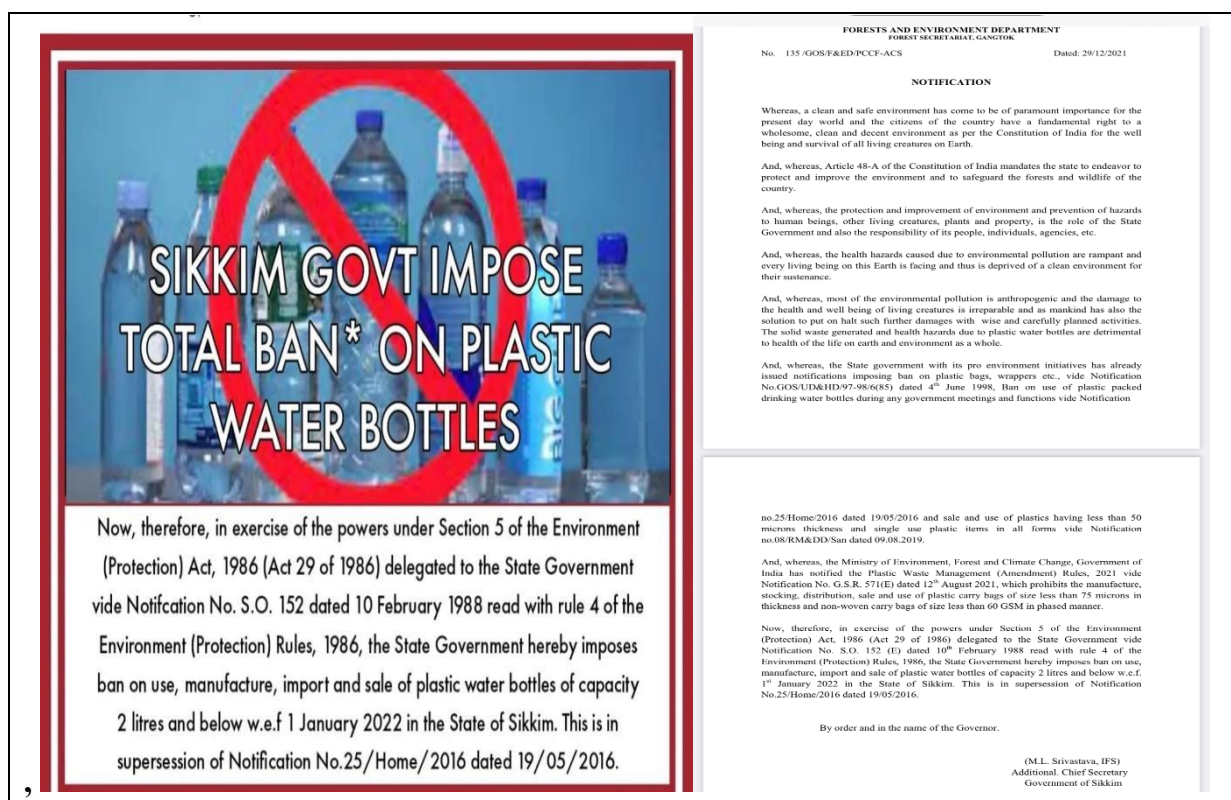
- Ban in Styrofoam
- Ban on Packaged Water Bottles
- Ban on Burning of Waste
- Ban on Fire crackers
- Ban on Plastic Carry Bags.

Different notifications were issued for adapting Green Policies in the State of Sikkim one of the recent ones are follow:

1. The notification issued by the Forest and Environment Department, Forest Secretariat, Gangtok on 29/12/2021 imposes a ban on the use, manufacture, import, and sale of plastic water bottles of capacity 2 litres and below in the State of Sikkim, effective 1st January 2022. The decision is made under Section 5 of the Environment (Protection) Act, 1986. This supersedes a previous notification from May 19, 2016 (No.

25/Home/2016).

Figure No.3. Notification on Ban on Plastic Bottles by Government of Sikkim



Suggestions

Gangtok has implemented several waste management initiative, with the Gangtok Municipal Corporation taking responsibility for handling waste from households, institutions, hotels, and restaurants. Key challenges include waste segregation, recycling, efficient collection,

sustainable recovery and proper disposal. To address these, waste must be treated differently through identification, reusing, recycling and composting, unified with a sustainable framework with priority on monitoring.

The city's waste issue, such as leachate formation, unregulated landfills and solid waste burning, pose significant risks to ecosystems, land and water use, and public health.

Key focus areas for improvement include:

1. Infrastructure: Upgrading sorting/treatment facilities, closing dumps, constructing landfills, and providing bins, trucks, and transfer stations.
2. Legal and Institutions Frameworks: Implementing sound policies and coordinated institutions for municipal waste management.
3. Financial Sustainability: designing effective taxes, fees and long-term cost recovery plans.
4. Citizen Engagement: Encouraging waste reduction, segregation, and reuse through incentives and awareness campaigns.
5. Climate Action: Promoting environmentally sound disposal, reducing food waste, and adopting technologies to capture biogas/landfill gas.
6. Healthy and Safety: Reducing open burning pests, and disease risks while improving live hoods.

These efforts span multiple sectors, including energy, sustainability, agriculture, health and social protection, ensuring Gangtok's waste management aligns with broader development goals.

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