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Investigations on Solid Waste Management in Gurdaspur and its adjoining areas

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ABSTRACT

The survey conducted in Gurdaspur raised focus on crucial concerns about solid waste management across several industries. The biomedical facilities, which encompass dispensaries and a veterinary hospital, exhibited inadequate waste segregation and disposal protocols. The civil hospital demonstrated improved waste management, however it encountered difficulties in maintaining the trolleys. Within the sugar mill sector, multiple forms of waste have been recognized as both recyclable and non-hazardous. In contrast, the rice mill business faced challenges due to insufficient measures in dust and soil management, resulting in worker health issues. Inadequate management of agricultural waste from crops such as rice, wheat, sugarcane, maize, and oil-yielding crops had a negative influence on soil texture and biodiversity. The management of municipal garbage has exposed various shortcomings, such as the practice of openly disposing of rubbish, inadequate separation of different types of waste, and poorly built containers for collecting waste. Transportation practices contribute to environmental damage. The survey highlighted the necessity for enhanced waste categorization, more comprehensive surveys, and heightened awareness to improve solid waste management methods in Gurdaspur. Suggested measures involve the strict implementation of waste management regulations and the resolution of shortcomings in many sectors. It is imperative to tackle these concerns to advance environmental sustainability and ensure efficient management of waste in the region.

Keywords: Biomedical waste, waste segregation, agricultural waste, environmental impact, sustainability

INTRODUCTION

Solid waste is a heterogeneous mixture. It includes garbage, kitchen waste, paper, fabric, plastic, wood, metals, hospital waste, rubber tyres, automobile parts, crop residue, glass, broken or discarded household appliances etc. There is not any set principle to classify solid waste but it has been classified differently by different workers as per the best understanding. Based on their nature the solid wastes can be classified into biological (infectious, non-infectious), chemical (organic, inorganic, inert) and hazardous and non-hazardous categories (biomedical, industrial waste).Based on the source of origin from which solid wastes are generated, these can be classified into different categories i.e., municipality waste, industrial waste, mining waste, agriculture waste, sewage waste, construction waste, dead animals, human excretal waste and hospital waste. The municipalities or municipal corporations are the biggest waste collectors and disposers of the waste generated by the urban population. This includes both rubbish and garbage that come from the street sweeps, residential bins, offices, schools, backyards, shops etc.

Hospitals generate waste that is hazardous in nature. The amount of waste in hospitals, nursing homes, clinics and pathological labs is increasing day by day due to the growth of services provided to patients and the use of disposables. Hospitals produce both non-hazardous and hazardous refuse. The disposal of various types of refuse in communal dumping areas could potentially pose health hazards to the general populace. Therefore, it is imperative to establish regulations for these refuse materials and devise a comprehensive system to ensure their appropriate treatment and disposal. Hospital waste can be categorized into general and biomedical waste categories. General waste generated from hospitals includes packing materials, garbage, kitchen waste etc. which are not infectious in nature. Such wastes can be disposed of at the common dumping sites. Conversely, biomedical refuse possesses infectious properties. Biomedical waste encompasses any solid, liquid, or gaseous refuse produced in the course of diagnosing, treating, or immunizing animals or humans (Rao, 2015).

The haphazard disposal of this type of refuse endangers the health of rag pickers, sanitary workers, and the general populace. A vast array of wastes can be segregated from biomedical waste. Chemical wastes include materials from diagnostics and experimental work. Pathological wastes include tissues, organic body parts and human foetuses. Highly infectious wastes include pathogens in sufficient quantity. These include infectious agents from laboratories, wastes from surgery and waste from animals inoculated with infectious agents (Singh, 2021). Sharp objects include needles, blades, broken glasses, syringes, scalpels and other instruments used in surgery. Pharmaceutical wastes include pharmaceutical products, drugs and different types of chemicals. As a result of the rapid expansion of the consumer market, products are increasingly packaged in nondegradable materials such as aluminium foils, plastics, and cans, which cause incalculable damage to the environment. Punjab is primarily an agricultural state. There are 134 towns and 12,342 villages. Total solid waste generation in the urban areas of Punjab is about 4,000 tonnes per day. In rural Punjab consisting of 12,342 villages, garbage (including household waste, cattle dung, agro waste etc.) is generated. According to estimates made by the Punjab Agricultural University, Ludhiana, the paddy and wheat straw, available in Punjab are 15 million tonnes and 18.5 million tonnes respectively. In addition, 3.3 million tonnes of rice husk is available in the state. It is estimated that municipal garbage contains roughly 55 percent organic waste (like fruits, grasses, leaves, paper etc.), 19.6 percent incinerable (like leather, textile waste etc.), 18.7 percent is recyclable waste (like glass, metal etc.) leaving only 6.8 percent waste of the total garbage as inert matter. There are 132 hospitals, 24 primary health centres and 242 dispensaries in the state. In the state, it is roughly estimated that 700 tonnes of waste is being generated annually in hospitals. Solid waste generated in urban areas is comparatively more in quantity. In urban areas, a person produces approximately 450-500 gms of solid waste. The urban and rural solid wastes differ considerably in the type of solid waste, composition, disposal methodology, treatment and hazards posed by the waste. In rural areas, solid waste usually includes household waste, animal waste, farmyard waste, human waste and rubbish. Urban solid waste includes treatment plant waste, rubbish, ashes, construction waste, household waste and kitchen waste. People in urban areas are comparatively more aware of the harmful effects of solid waste. Some people started segregating biodegradable and non-biodegradable waste into two different bins or containers. Wastes are disposed of by landfilling, incineration or composting. People in rural areas have sufficient land to dispose of the waste but they do not do it due to lack of knowledge. Some educated farmers are adopting vermicomposting techniques to get rid of the solid waste. In urban areas, there is a problem of land availability. People in urban areas generate more waste due to the changed lifestyle, approach of convenience, use and throw policy and increasing population. Over the past few decades, Municipal Solid Waste (MSW) production in India has increased substantially. This is predominantly attributable to the nation's economic development and accelerated population growth. Municipal solid waste generated per capita in India varies between approximately 100 g in minor towns and 500 g in large towns.

This trend of increasing waste day by day is directly proportional to population. The rate of generation of solid waste is directly related to the changed lifestyle, food habits, approach of convenience, use and throw policy, excessive per capita resources need and increased population density. The extent of recycling, public attitude and legislation also play a key role. In recent years, many eco-friendly approaches and technologies have been developed to manage solid waste. These techniques can help in the proper management of solid wastes. The 4R rule can play a great role in the management of solid waste (Kumar & Agrawal, 2020).

Biogas or gobar gas is a source of energy generated from cattle dung, human excreta and vegetable wastes. Gobar gas or biogas plants have been installed mostly in rural areas. The left over material after extraction of gobar gas from cow dung, known as slurry, is used as manure in the fields. This manure is rich in nitrogen and phosphorus. It does not produce smoke whereas cattle dung cake and wood produce a lot of smoke while burning. Moreover, it saves electricity. It produces more heat energy as compared to the energy produced from the burning of cattle dung cakes and firewood. The waste produced in the process of making biogas is used as manure in agriculture. It is an environment-friendly fuel. In some places, domestic sewage is digested in large biogas plants. This not only provides useful gas but also helps to control water pollution. Methane gas extracted from municipal wastes such as human excreta and rotten vegetable matter can be used to run a gas turbine. The turbine generates electricity for running an irrigation pump.
Compost can be prepared from organic waste such as vegetable matter, fruit peel, waste food, dead leaves of plants etc. The use of earthworms for the management of different types of solid wastes is an environmentally sound technology. It is an economical technology having dual benefits. It converts solid wastes into nutrient-rich manure. So by using vermicomposting technology we can get rid of solid wastes and at the same time generate a biofertilizer. There is a dire need to popularize all eco-friendly technologies for the proper management of different types of solid waste.

Current research focused on solid waste management and characterization in Gurdaspur and its surround-dings. The study collected data on solid waste types. Municipal, biomedical, industrial, and agricultural solid wastes were considered. These solid waste management solutions were also evaluated. This is the first survey of its kind in Gurdaspur, Punjab. Warning individuals about solid waste mishandling is crucial. Researchers must also design eco-friendly methods. Expert evaluations show that if we don't dispose of solid waste more efficiently, the country will need 1400 Sq. Km. of land, the size of Delhi, by 2047 (Kumar & Agrawal, 2020).

MATERIALS AND METHODS

This study focused on characterizing and managing solid waste in the Gurdaspur area of Punjab. Gurdaspur district is located in the northwest part of the state, near the India-Pakistan border along the Indian side of the river Ravi. Part of the district is located on the other side of the river Ravi. Gurdaspur district is situated between North latitude 31° - 36^1 and 32° - 34^1 and East longitude 74° - 56^1 and 75° - 24^1. The area is bordered by the Kathua district of Jammu and Kashmir to the North, and the Chamba and Kangra districts of Himachal Pradesh to the North-East and East, respectively. Hoshiarpur district is located in the southeast, Kapurthala district in the south, Amritsar district in the southwest, and Pakistan in the northwest of this district. The area of Gurdaspur tehsil is approximately 1358.28 square kilometers. Beas and Ravi are the primary rivers in Gurdaspur district, originating close to the Rohtang Pass in Himachal Pradesh. The district being studied is located in the Indo-Ganga alluvium area, with hills of the Shiwaliks stretching from North-West to South-East, creating the foothills of the Himalayas. Fossils of vertebrates found in the Shiwalik formation suggest a rich proliferation of animal life that was later wiped out by intense glaciation in the upper Pleistocene epoch. The district contains minerals such as construction stone, foundry sand, gold, calc-tuffa limestone, ochre, and saltpetre. Building materials can be located in the perennial stream and on hill slopes. Earthen bricks are located in the riverbeds of Ravi, Chakki, and Beas, with foundry sand being discovered at Dharamkot near Batala. Temperature gradually rises from the start of March until June, which is the warmest month. In June, the average daily high temperature on the plains is 40.2°C, while the average daily low temperature is 26.1°C. The elevated areas have a colder climate, with temperatures often surpassing 35° C. When the South-West monsoon arrives early in September, there is a small rise in daytime temperatures while nights turn cooler. January is typically the chilliest month. The maximum daytime temperature is 18.4°C and the minimum temperature is 5.6°C. The weather is coldest by many degrees in the hilly parts of the district than in the plains. The Gurdaspur district is rich in floral and faunal biodiversity. The present study was undertaken to assess the solid waste management techniques. Simultaneously, the characterization of various types of solid wastes was also done. Different types of methods were used to collect information regarding various types of waste production and its management. The survey was done by studying the different parameters regarding different types of solid waste in the Gurdaspur area. These were biomedical waste, industrial water, agricultural waste, municipality waste and poultry waste. Regarding the generation of different categories of biomedical waste, a survey was done by studying the six dispensaries in Gurdaspur, a veterinary hospital and a civil hospital. Various types of waste studied were human anatomical waste, soiled waste (Degradable waste), waste sharps, solid waste (microbiology and biotechnology) and non biodegradable and infectious waste. In the dispensaries of Behrampur, Jhapkra, Marara, Dodwan, Bharath and Turchib different parameters studied were anatomical waste, soiled waste, waste sharps and solid waste.

RESULTS AND DISCUSSION

Biomedical trash is waste generated by healthcare facilities such as hospitals, clinics, and veterinary hospitals. Biomedical waste generation and management survey was doneby taking six dispensaries, a veterinary hospital and a civil hospital located in Gurdaspur district of Punjab. The types of wastes studied were Human anatomical wastes (including placenta, organs, tissues and body parts), waste sharps (including needles, syringes, blades, glass etc., soiled waste including cotton, bedding, bandages etc.) and solid waste (including broken instruments, plastic, gloves, disposable items other than sharps, tubing, dishes and devices of laboratory etc.).

In Behrampur dispensary quantity of waste generated was 190 kg (Human anatomical waste), 6016 kg (waste sharps), 43 kg (soiled waste), and 232 kg (solid waste/microbiology and biotechnology wastes). In the Jhapkra dispensary amount of waste produced was 184 kg, 5474 kg, 42 kg, and 374kg of human anatomical waste, waste sharps, solid wastes, and soiled waste [microbiology and biotechnology wastes] respectively. In the Marara dispensary, 26kg, 5100 kg, 216 kg of human anatomical waste sharps, soiled wastes, and solid waste [microbiology and biotechnology waste] respectively were produced. In the dispensary of Bharath village quantity of production of human anatomical waste, waste sharps, soiled wastes, solid waste (microbiology and biotechnology waste, were about 140 kg, 4086 kg, 27 kg, 224 kg respectively. In the case of Dodwan dispensary amount of waste produced was 132 kg (human atomical waste), 5705 kg (waste sharps), 25 kg (soiled wastes), and 290 kg (solid waste/microbiology and biotechnology wastes). Similarly in village Turchib dispensary 144 kg (human anatomical waste), 4481 kg waste sharps), 22 kg (solid wastes) and 153 kg (solid waste (microbiology and biotechnology waste) were produced. In civil hospitals Gurdaspur production of biomedical waste was 2648 kg (human anatomical waste), 130845 kg (waste sharps), 240 kg (soiled waste) and 645 kg (solid waste/ microbiology and biotechnology wastes). The present study also shows that a huge amount of waste is generated in veterinary hospitals. In the Government veterinarian of Gurdaspur about 118 kg of animal waste, 310 kg of waste sharps, 3105 kg of soiled waste and 260 kg of microbiology and biotechnology waste were produced.

Managing, segregation, destruction, disinfection, preservation, transportation, and final disposal are crucial phases in the safe and scientific management of biological waste. Categorizing biomedical waste can be effectively done by separating it into colour-coded plastic bags or containers. Also according to the biomedical waste management rule (schedule), four types of bags should be used for the segregation of biomedical waste. Yellow plastic bags are suitable for human anatomical waste, animal waste, microbial trash, and dirty garbage. Red bags are advised for waste tubes, catheters, etc. while puncture-proof containers are suggested for disposable sharps, discarded medicines, incineration ash, chemical waste and green plastic bags should be used for general waste. In all dispensaries and veterinary hospitals, there was no proper identification and segregation of waste in colour-coded plastic bags or containers. Sharps were not collected in puncture-proof containers. All garbage was collected in one container without a biohazard sign. Autoclaving did not sanitize highly contaminated trash. Not all dispensaries and veterinary institutions used needle destroyers and cutters at the point of generation. These were put in cemented trenches dug underground, which constituted improper disposal. Sharps, plastic, rubber, and filthy linen were not disinfected at generation. Gurdaspur Civil Hospital identified and separated garbage in color-coded plastic bags or containers. However, container management was poor. The hospital also used wheeled trolleys and containers to move garbage. These had no other use. But trolley maintenance was poor. Biohazard symbols were on puncture-proof sharps containers. Highly contagious trash was autoclaved. Needles and syringes were eliminated with a needle destroyer and cutter at generation. Curved scissors cut infusion sets, bottles, and gloves. These were disinfected at generation with sodium hypochlorite for 1 hour. New solutions were made each time. Human anatomical waste that was infected was first incinerated and then ash was generated. When it became disinfected it was spread in the open areas. Five dispensaries, one veterinary hospital, and a civil hospital were compared for waste generation and disposal of anatomical waste, sharps, plastic, dirty solid waste, etc. Biomedical waste management was introduced in Gurdaspur's civil hospital under the Biomedical Waste Management (1998) Rules (Kaur, 2023). It separated generation-level garbage into colour-coded bags and plastic drums. Internal garbage transfer via trolleys to the kerb site, storage in various coloured metallic drums, and infectious waste transit to the on-site incineration were all in place. When handling rubbish, sanitation workers wore gloves, masks, and shoes. Sodium hypochlorite was accessible at all Sharp production sites and departments. However, waste segregation was not properly implemented at the dispensaries and veterinary institutions where it was generated. No bags were utilized with colour coding. All forms of trash are collected in identical containers such as carts. Sanitation workers lacked adequate protective gear such as gloves and masks, increasing their susceptibility to infectious diseases.

Civil Hospital Gurdaspur sent hazardous waste to the central incinerator. Other hospitals did not incinerate. Broken plastic buckets were utilized in dispensaries and veterinary institutions. There was no successor. Hypochlorite solution for sharps existed. Poor segregation occurred. Hospital garbage was dumped inside and rag pickers sold plastic waste to contractors. Municipal or State Pollution Control Board solely inspects common waste facilities. Central incineration should be required for hospitals with malfunctioning incinerators since they pollute. After reviewing the data and current situation, it was found that hospitals must standardize their infrastructure to follow the Biomedical Waste Management and Handling Rule. Hospitals with no or poor incineration should use central facilities as the government reduces incinerations to reduce air pollution.

Industrial Waste

The waste arising from industries is known as industrial waste. 7 Km away from the city "Paniar Sugar Mill Corporation" industry was situated. This sugar mill was established in the year 1980. The total area covered by the sugar mill was about 60 acres. In the year 2007, the total working days of the sugar mill were 138 and 2530190 quintals of sugarcane were crushed and 25670 quintals of sugar were produced. According to the last Environment State Management Report, all types of waste from sugar mills were recyclable. Types of waste generated were bagasse (coke), ash, molasses, press mud and dry sludge. During the crushing of sugarcane, two types of material were formed: bagasse and sugar cane juice. Bagasse production in 2006-2007 was 2373490 quintals which was used as fuel to the boiler. After burning the bagasse as fuel, about 28000 quintals of ash were formed, which was used for landfilling in low-lying areas in the city. From sugar cane juice two types of waste were formed: molasses (22000 quintals) as a by-product and press mud (22500 quintals). Molasses were sold to those industries which used it for the preparation of alcohol, wine, spirit, vinegar etc. Press mud was sold to the farmers as fertilizer. But a few years back this industry started a bio-composting unit inside the industry where press mud was used for the formation of manure from earthworms. When the manure (vermicompost) was ready it was sold to the farmers. Dry sludge waste was about 20000 quintals formed from the management of wastewater in the industry. An effluent treatment plant was set up inside the industry which was used to treat the waste water. The waste water was taken in the irrigation tank where bacterial growth was provided. This wastewater contained those suspended particles which were not separated by filtration(Al-Lahham et al., 2003). When the bacteria were grown in large amounts, the water containing bacteria and suspended solid particles were transferred to the clarifier, where bacteria died due to the overdose and they settled down. The settled-down material known as sludge was in the form of solid waste. This sludge was used for land filling in low-lying areas.

Rice mill in Gurdaspur

In Gurdaspur city, 50000 quintals of paddy were allotted to the mill. This survey was done in the rice mill with a capacity of 2 tonnes. In the rice mill, from paddy, four types of material were obtained i.e. rice (33500 quintals), chaff (6000 quintals), rice bran (5000 quintals), dust and soil particles (4500 quintals). In the rice mill from 50000 quintals of paddy, 33500 quintals of rice were obtained. Rice was used as food. From the rice after polishing, about 6000 quintals of chaff was obtained which was sold to those factories which used this chaff for the manufacturing of cardboard, notebook covers etc. Chaff was also used as fuel(Gul et al., 2010). The third material which was released from paddy was rice bran (about 5000 quintals) used to manufacture oil. After that 4000 quintals dust and soil particles were released. This was used to throw in low-lying areas outside the city. Only this fraction generated from rice mills acts as solid waste. From this survey, it was concluded that dust and soil particles emitted from rice mills were not properly managed(Sekhon et al., 2003). Also, no proper masks and personal safety equipment were provided to the workers serving in the rice mill. Dust released from the mill causes many respiratory problems for the workers.

Agricultural Waste

Agricultural waste arises from agricultural crops after harvesting is done. Punjab is the border state of India, situated geographically in the Northern region. The district Gurdaspur is bounded by Amritsar and Hoshiapur districts. It shares its border with Jammu and Kashmir, Himachal Pradesh states of India as well as Punjab state of Pakistan. The land of the Gurdaspur district is very fertile. The soil of this area is formed by the soil brought by the rivers of the Himalayas. This area is irrigated by the main river Upper Bari Doab Canals (UBDC). Nowadays, irrigation does not depend upon the rivers but on the tube wells etc. Area of Gurdaspur city under cultivation is about 258000 Hectares (25800 Acres).The main crops grown in this area were found to be rice, wheat, sugarcane, maize and mustard. 40 percent cultivated area was under wheat crop, about 35 percent area was under rice cultivation while in about 12 to15 percent area sugarcane was grown(Gulati & Mohan, 2018).10percent area was under maize cultivation and about 3 to 5 percent area was under mustard crop cultivation (oil-yielding crops).Annually, about 225750 quintals of rice were produced in this area. The waste generated was in the form of rice straw, husk etc. About 97400 quintals of which were used as fodder. The waste generated from harvested crops by combines was burnt in the fields. The crop yield from wheat was about 226400 quintals per year. Waste generated from this crop was in the form of wheat husk and straw. Its amount was 10320quintals. Most of this waste was used as fodder for the cattle and the rest was burnt in the fields. Third most cultivated crop grown in the Gurdaspur area was sugarcane. The annual production of which was about 116100 quintals. Most of the sugarcane was sold to the sugar mill of Paniar and waste generation from sugarcane was bagasse which was about13932 quintals. Bagasse was used as fodder for the animals and as fuel in a few rural areas. But in the sugar mill it was used as fuel for the boiler and after burning the bagasse ash was produced which was used for vermicomposting. After vermicomposting when manure was ready, it was sold to the farmers. They used it to increase the soil fertility. Maize was also a cultivated crop in the Gurdaspur area and its waste was in the form of maize straw which was about 2010 quintals per year. It was used as fodder to the animals and the rest was burnt as fuel. Various oil-yielding crops were also grown in this area. These include mustard, till, and toria. The waste generated was in the form of straw. This was used as fodder.

The management of agricultural waste was not satisfactory. It was not done according to the environmental laws. Most of the waste was burnt in the field which created environmental pollution as well as decreased soil fertility (Nagendran, 2011). Many useful microorganisms and insects burnt in the field fire. The texture of the field's soil also changed due to the field fire. The agricultural department was not aware of the management of waste and also did not strictly apply the law. The Environment Protection Act should be applied strictly in case of management of agricultural waste so that the burning of waste crops should be banned. Management of agricultural waste processes should be recommended by the agricultural department so that farmers can apply these processes and can get the benefits from waste in the form of manure etc. Techniques like vermicomposting and simple composting can play a significant role in this direction (Kaur & Kaur, 2017).The area under rice cultivation should be decreased so that falling levels of groundwater can be prohibited. In the place of rice, some other leguminous crops like Peas and Beans should be grown. The farmers should be educated by the Agricultural Department by organizing seminars and exhibitions etc.

Municipality Solid Waste

As per the Population Board Act of 2001, the population of Gurdaspur city was 67,700. A Municipal Corporation with 19 wards and one with 129 wards, both have an elected council. The municipality produced 6 tonnes of garbage every day. The Gurdaspur municipal corporation prioritized public health-related initiatives the most. Gurdaspur, an ancient and disorganized city, prioritized consistent cleaning to avoid illness outbreaks and epidemics (Dhaliwal, 2002). The types of municipal garbage generated in the Gurdaspur area and their respective percentages are: paper (3.0%), glass (12.5%), textile (10.5%), kitchen and garden waste (45.2%), street sweeping waste (5.8%), metals such as iron (0.2%), and polythene (22.8%). The several techniques employed for municipal trash management. The treatment of solid waste was experiencing difficulties due to institutional weakness, lack of strategic planning, paucity of financial and human resources, and inefficient management techniques. The service level was unsatisfactory. There was no waste storage system at the point of origin. The majority of the populace used to dispose of rubbish on the streets in open areas. Recyclable waste segregation was not commonly used. Most of the recyclable material was discarded along with household and commercial rubbish on the streets, etc. Poor rag pickers collected recyclable items such as metals and plastic and sold them to retailers (Suthar et al., 2016). No system was established for the primary collection of hotel and restaurant waste. Thus, people discard this garbage on the streets or in public dumpsters. Vegetable, fruit, meat and fish markets do not have adequate storage facilities. As a result, market waste is thrown in open spaces which cause unhygienic conditions in the markets. There was an inadequate mechanism for the initial collection of building waste. Individuals commonly disposed of construction debris in the surrounding streets. Street sweeping was the principal method of rubbish collection. 200 sweepers employed by the municipality cleaned the entire city.90% of them possessed carts that were antiquated and had obsolete designs. Sweepers transported street-sweeping rubbish in conventional wheelbarrows to storage sites. The city produced 6 tonnes of rubbish each day, with 48 percent being organic waste and the remaining portion being recyclable. The city had poorly designed dustbins for waste storage. The trash storage depots were either open or masonry, which were unsanitary and unscientific. There were no established job standards. No services were supplied to the slum regions. Transportation was conducted utilizing uncovered vehicles and tractor trolleys, which inconvenienced inhabitants and led to environmental damage. Workers manually put the trash onto these vehicles, causing harm to their health. The city lacked sufficient acreage for waste disposal and was disposing about 90% of rubbish in low-lying areas. Here are the recommended steps to enhance solid waste management in Gurdaspur: Enhance the solid waste management plan by completing a need assessment with relevant entities at the ward level. Establishing a municipal waste management cell within the municipal corporation is essential for creating suitable institutional structures. Improving stakeholder capacity can be accomplished through training, workshops, and exposure tours (Tchobanoglous, 2009). Providing necessary equipment and supplies to field personnel. Establishing a suitable legal framework via the State Government and related legislation is crucial for dealing with municipal waste management concerns. Conduct experimental and pilot initiatives at the ward level to pre-test and enhance the municipal waste management plan (Abdo et al., 2019).

Conflict of Interest: The author(s) declares no conflict of Interest.

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