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ASSESSMENT OF SOLID WASTE MANAGEMENT AT TATINAPARA VILLAGE UNDER LABPUR COMMUNITY DEVELOPMENT BLOCK OF BIRBHUM DISTRICT IN WEST BENGAL, INDIA

Kartick Chandra Mandal
Former Master Degree Student, Department of Education
Netaji Subhas Open University, Kolkata, West Bengal, India

Abstract
Solid waste management plays a crucial role in maintaining a healthy and sustainable environment. Solid waste and its management have become a burning issue in the present world. Developed and Developing countries have given a special focus on policy and the practices of solid Waste management in urban and rural areas simultaneously as well as India has launched Swachh Bharat Abhiyan (SBM) Programme in 2014 for enhancing the country's Solid Waste Management. This research work concentrated on the Assessment of solid waste management at Tatinapara village in Labpur Community development Block of Birbhum District in West Bengal, India. The main objectives of the study are to find out the source, estimate volume of solid Waste Generation and its management practices, impact on human health and environment and also recommended some necessary suggestions to overcome the problem related to the waste management practices. The method of the research work is based on a field survey that is both qualitative and quantitative research method. Primary databases for the research have been collected from door-to-door Survey with preformatted questionnaires and the secondary data has been collected from the various authentic sources after collecting the data it has been analyzed and interpreted through the proper way according to the needful. The result of the research work found that this area is under developing. The villagers are not aware about the environment and health problems. They perform the traditional and poor solid Waste management however Government of West Bengal has taken initiative for proper solid waste management with giving garbage transportation rickshaw, construction waste Dumping places and others necessary items for the Tatinapara village.

Keywords: *Sustainable Environment, Solid Waste Management, Swachh Bharat Abhiyan (SBM), Assessment, Practices, Traditional, Dumping places.*

Introduction

'Waste' refers to any unwanted or useless material or substance that is left over after the primary use or purpose of a product, process, or activity that has been fulfilled. Waste can be categorized into various types based on its origin, composition, and management methods.

1.Types of waste include according to their form:

(i) Solid waste: Solid Waste is everyday items such as paper, plastic, glass, and metals that can be seen and touched. (ii) Liquid waste: Liquid waste is in a liquid form, such as sewage, industrial effluents, and contaminated water. (iii) Gaseous waste: Gaseous waste is in the form of gasses, such as carbon dioxide, methane, and volatile organic compounds emitted from industrial processes or vehicles.

2.Some common types of waste include according to their sources:

(i) Agricultural Waste: Agricultural waste generated from agricultural activities, such as crop residues, animal manure, and processing waste from food production.

(ii) Industrial Waste: Industrial waste generated during industrial processes, manufacturing, construction, and mining activities. It can be hazardous or non-hazardous, depending on the materials and substances involved.

(iii) Hazardous waste: Hazardous waste poses a threat to human health and the environment, such as chemicals, batteries, and electronic waste.

(iv) Biodegradable waste: Biodegradable waste comes from organic materials like food scraps, yard waste, and animal waste, which can be broken down by microorganisms.

(v) Non-biodegradable waste: Nonbiodegradable waste does not decompose easily and remains in the environment for a long time, such as plastics, glass, and metals.

(vi) Medical waste: Medical waste consists of items used in healthcare settings, such as syringes, bandages, and contaminated dressings.

(vii) Municipal Solid Waste (MSW): Municipal Solid Waste, waste generated by households, commercial establishments, and institutions in urban areas. It consists of various materials such as paper, plastic, glass, metals, textiles, food waste, and garden waste.

(viii) Electronic Waste (E-waste): Electronics Waste or E-waste generated from discarded electronic devices and equipment, such as computers, mobile phones, and televisions. E-waste contains hazardous materials like lead, mercury, and cadmium, which can harm the environment and human health if not managed properly.

Solid Waste is the outcome of anthropogenic activities. Poor Solid Waste Management practices lead to a negative impact on organisms and environment (Samieifard et al,2008). Solid waste management denotes the process of collecting, treating and disposing of solid wastes. Solid waste can be domestic, agricultural or even industrial wastes. In the waste management process, the wastes are collected from different sources and are disposed of. This process includes collection, transportation, treatment, analysis and disposal of waste. It needs to be monitored so that strict regulations and guidelines are followed. Improper disposal of solid waste can create unsanitary conditions of environment, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease that is spread by rodents and insects. India produces 277.1 million tonnes of solid waste every year, which is likely to touch 387.8 million tonnes in 2030 and 543.3 million tonnes by 2050 due to ‘rapid urbanization, population growth, and economic waste management in rural area should main purpose to promote the outcome a clean and healthy environment that has health, economic and environment benefit (Gour et al.,2022). The present study on assessment of solid waste management have a vital role to find out the condition of human health and environment on that area through solid Waste After collecting ground level data through the field survey that is find out the problem of the area related to environmental and waste management approach.It also focus on to determine the mitigation strategies for poor solid Waste management practices.Solid waste management related many research work has been done in urban areas but this type rural area base solid Waste management relevant research work has not been done yet so I have to chose this type work.

Literature Review:

Dutta et al. (2008) has focused on such a precarious scenario of solid waste generation, poor management system and consequences in Barddhaman Municipality, West Bengal. The problem is the product of rapid unplanned urbanization, high population growth rate as 14.19% (1991-2001), and lack of civic sense among dwellers in spite of high literacy rate as 76.4% (2001). The volume of uncollected domestic waste was about 65.83 tons/ day in 2008 due to negligence of governance. Major sites of poor waste managements are at vegetable market, agro-based industries, hospital, nursing home, Pathological centers inevitably make a sullying mark on the urban landscape. Taboada et al. (2010) has presented the results of a characterization study obtained by direct analysis of household solid waste generated in two rural communities in northern Mexico, and also made an outlines a procedure for estimating the waste

generation rate when financial constraints prevent the development of a characterization study at home level. Attempted to fill the information gap on the generation and composition of solid waste in rural areas. Indicated the volume of waste generation in 0.631 kg/cap/day in San Quintín and 1.047 kg/cap/day in Vicente Guerrero. The specific weights of the uncompacted SW were respectively 145 kg/m3 and 123 kg/m3. The specific weight of the compacted SW was 229 kg/m3 in San Quintín. Statistically, the composition of waste between these two rural communities differs in one fraction. Ghosh et al. (2011) has attempted to critically analyze the present condition and problems of drainage, sewage and solid waste management in Bardhaman municipal area, West Bengal through statistical techniques and Geographic Information System. Sunil et al. (2016) have studied solid waste management in Gotkhindi village near Islampur. The predominance of open dumping and the absence of reliable data regarding generation and characterization of waste has created a difficult situation for rural local bodies responsible for managing solid waste generated in the village. Solid waste samples collected from a dump site analyzed for physical characterization that confirms its suitability for applying biological methods of composting. The waste characterization highlights the importance of waste segregation before sending the waste fractions for different waste-treatment technologies including composting and landfilling. The solid wastages are still a major problem in this rural area. Overcome from these problems Bangalore method of composting has been implemented. Wang et al. (2017) has described the overall state of Rural Solid Waste Management (RSWM) in China in three main areas: waste collection services, waste transportation services and waste disposal services. Given China's urbanization, industrialization, and the subsequent improvement of household living standards, the amount of solid waste generated in rural China has increased rapidly. Based on primary data collected in 2016 from 100 villages across five provinces in China, found that the proportion of villages with waste collection, waste transportation, and waste disposal services in 2015 are 80%, 55% and 22%, respectively. The differences in shares of villages with these services across provinces are statistically significant. richer villages are more likely to provide rural solid waste (RSW) collection and transportation services that has been shown Using descriptive and econometric analyses.The suggestions have included increasing investments in waste collection facilities and worker services; encouraging local residents to classify and recycle waste; designing optimal waste transportation networks and routes; and improving on-site waste disposal technology.

Objectives of the Study:

(i) To find out the source of waste generation in Tatinapara Village.
(ii) To estimate the volume of waste generated in the study area.
(iii)To describe and explain the current waste management system and practices in Tatinapara Village
(iv)To find out the impact of solid waste on human health and environment in the study area
(v) To improve the quality of life of the people at Tatinapara Village by promoting cleanliness and hygiene through waste management.

Hypothesis:

(i) The effectiveness of solid waste management in rural areas is influenced by the availability of resources, community awareness, and government policies.
(ii) Community awareness and participation are essential for promoting responsible waste disposal practices and encouraging recycling and composting.
(iii) Government policies and support can significantly impact the development and implementation of effective solid waste management strategies in rural regions.

Methodology

Field survey base qualitative research method has been used to conduct this
work so the methodology of this work has divided into three parts that are following-

(i) Pre- Field Work: In this stage, preparation of field study included of collection to topographical map (73M/10) of the study area from the survey of India, collecting census data from the district handbook (2011).

(ii) Field work: This stage includes field study that would be a personal visit to Tatinapara village for collecting data with the help of a Pre-Planned Structure questionnaire. Beside the collection of data through door to door surveys from households, it is also considered that data has also been collected from various books, reputed journals, magazines, and authentic publications of the Central and state governments and local sources related to the work.

(iii)The Post Field work: In this stage, all types of primary and Secondary which is collected before such as demographic, Educational, health, solid Waste and its management related then it has been sorted and represented graphically through various cartographic methods and Statistical methods to make the research work more effective and authentic (Mandal,2023).

Location of the Study Area: Tatinapara village under the study area is located at southeast part of Chowhatta Mahodary No-2 Gram Panchayat. It is located at 07 KM from Labpur Railway station and 09 KM from Kopai Railway Station. This village is 5.6 km away from Labpur tehsil or community Development block. This Study Area lies between 23°77' 24" North Latitude to 23°78' 24" Northlatitude and 87° 74 '20" East Latitude to 87° 75' 40"East Latitude. Total geographical area of the village is 145.32 hectares. Tatinapara village has 191 households and 759 total population according to the 2011 census data. The main source of income of the villagers is agricultural base. Tatinapara is the Hindu populated village and different caste categories people such as General, OBC SC and ST are there. Bolpur which is a cultural city, is the nearest town to Tatinapara village which is approximately 25 KM away (District Statistical Hand Book,2011 & District Census Handbook Birbhum, 2011).

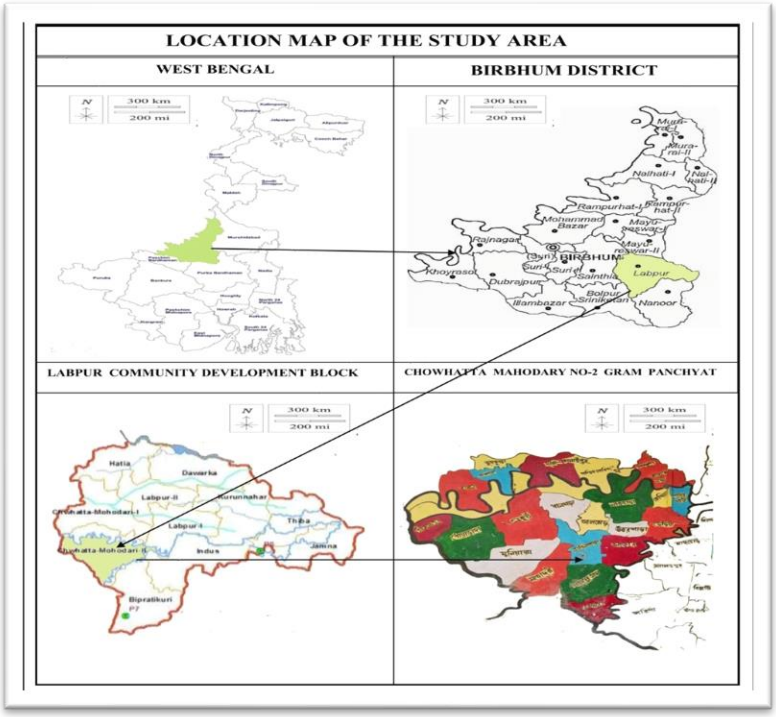

Figure: 1. Location Map of the Study Area

Result and Discussion:

1. Step of Solid Waste Management process:

Solid waste management typically includes the following steps-

(i) **Waste reduction and recycling**: Encouraging people to produce less waste by reusing, repairing, or donating items, and promoting recycling to minimize the amount of waste that goes to landfills or incinerators.

(ii) **Waste collection**: Regular collection of waste from households, businesses, and public places, using appropriate vehicles and methods.

(iii) **Waste transportation**: Moving collected waste to processing facilities or disposal sites in an organized and efficient manner.

(iv) **Waste treatment**: Processing waste materials to recover valuable resources, reduce the volume of waste, or convert waste into energy through methods like composting, anaerobic digestion, and waste-to-energy incineration.

(v) **Waste disposal**: Final placement of waste in landfills, incinerators, or other designated sites, ensuring proper containment and monitoring to prevent pollution and health hazards.

(vi) **Waste monitoring and regulation**: Implementing and enforcing policies, standards, and guidelines to ensure proper waste management practices and minimize negative impacts on the environment and public health.

2. Existing Solid waste management practices in the Tatinapara Village:

(i) Waste Treatment: Traditional methods of waste treatment include composting and vermicomposting for biodegradable waste. Composting involves the decomposition of organic waste by microorganisms under controlled conditions, while vermicomposting uses earthworms to break down organic matter and produce nutrient-rich compost. This treated compost is then used as a natural fertilizer in agriculture.

Figure: 2. Composting as Natural fertilizer

(ii) Waste Disposal: In rural areas, waste disposal mainly focuses on ensuring that waste is disposed of in a manner that prevents environmental pollution and health hazards. Biodegradable waste is often disposed of in designated areas called "composting pits" or "vermicomposting units." Non-biodegradable waste is stored separately and transported to recycling centers or proper disposal sites.

Figure: 3. Waste Disposal through Burning act as Source of Air Pollution

(iv) **Source Segregation**: Households and communities separate their waste into biodegradable (organic) and non-biodegradable (inorganic) components at the source itself. Biodegradable waste includes kitchen waste, agricultural waste, and animal waste, while non-biodegradable waste includes plastic, glass, metal, and other non-degradable materials. (Sunil et al.,2016)

(v) **Landfills**: Landfills are large areas of land where waste is buried. This is one of the most common waste management techniques in Tatinapara Village used today. Waste is compacted and covered with soil to prevent odor and pests.

Figure: 4. Landfilling practices through Waste

3. Present Status of Solid Waste Generation at Tatinapara Village:

Demographic status and educational status play a major role for developing a village as waste management is a vital environmental issue, so demographic status and the educational status of Tatinapara Village has been given here.

Demographic Status of Tatinapara Village: Demographic status plays a major role in socio economic development. According to the census 2011 Tatinapara village has a population of 759 in which male population is 394 and female population is 365. Total geographical area of Tatinapara village is 145.32 hectares so the population density is 759/145.32=5 people per hectare. Total number of households in Tatinapara Village is 191.Population growth rate is 16.15% (District Statistical Hand Book & District Census Handbook Birbhum, Census of India, 2011).

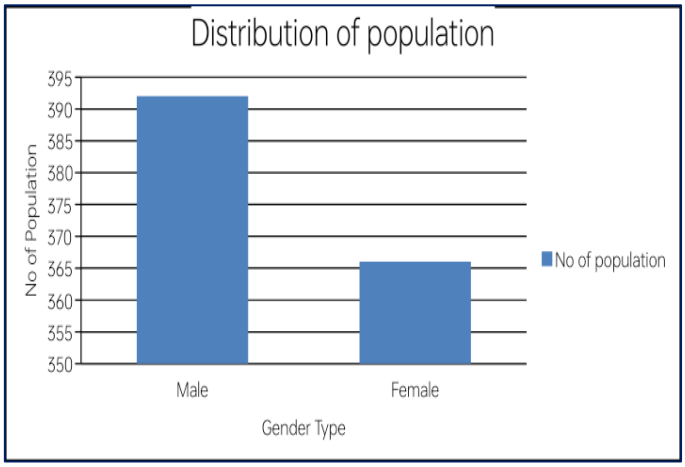

Figure: 5. Distribution of Population of Tatinapara village through sex (Male &Female)

Educational Status: TatinaparaVillage is a rural village with no facilities like urban areas in every aspects.As per field report Out of total population 415 people are literate among them 242 are male and 173 are female.Total literacy rate of Tatinapara Village is 61.94%where male literacy 70.14% and female literacy 53.23% literacy rate of village is satisfactory as a result of field survey (District Human Development Report, Birbhum,Government of West Bengal 2009).

Table: 1. Literacy Status of Tatinapara Village

Total Population	Literate Population	Illiterate Population
759	415	344
100%	54.67%	45.33%

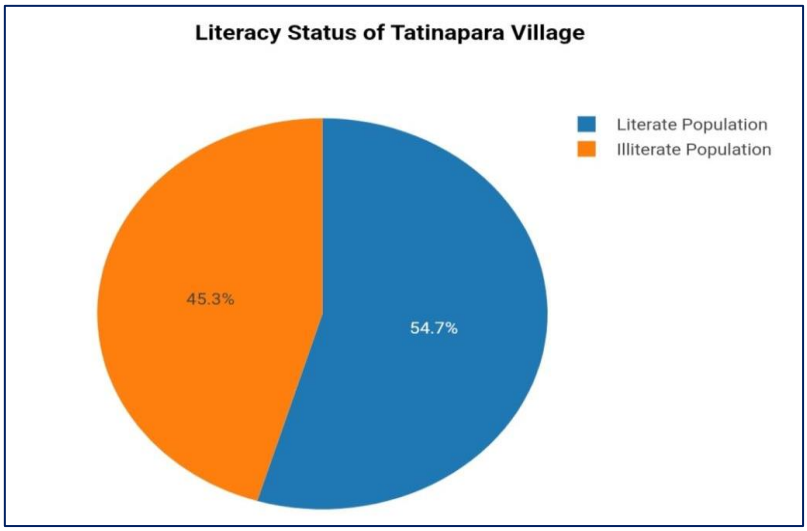

Figure: 6. Literacy Status of Tatinapara Village

Table: 1. General overview of waste generation in Tatinapara Village

District	Name of the Village	Total Number of Population	Total Number of Households	Total Amount of solid Waste Generated per day/Kg	Amount of Waste generated per Capita in Grams
Birbhum	Tatinapara	815	198	87	106.74

(Source: Field Survey, 2024)

Table: 2. Waste sampling data from 11 households and calculation Average Solid Waste Generated per capita

Sl number	Head of the family	Number of Family members	Generated waste (Gram)
1.	Haricharan Pal	7	600
2.	Gopal Pal	4	500
3.	Biswajit Kabiraj	4	700
4.	Debdulal Kabiraj	3	250
5.	Rajendra Prasad Ghosh	3	400
6.	Dualal Chandra Bagdi	9	700
7.	Mihir Das	7	800

8.	Ramtanu Siddhanta	3	400
9.	Barun Dutta	4	450
10.	Dilip Hembram	8	750
11.	Sunil Murmu	4	400

(Source: Field Survey, 2024)

Total Number of Sample Population = 56
Total Weight of Generated Solid Waste (Sample) = 5950 Gram
Average Solid Waste Generated per capita = 5950/56
= 106.26 Gram

Estimate of Future Waste Generation at Tatinapara Village:
Geometrical Increase Method Formula
Pn = Po[1 + (r/100)]^n,

where,
Po - last known population,
Pn - population (predicted) after 'n' number of decades,
n - number of decades between Po and Pn and,
r - growth rate = (increase in population/initial population) * 100 (%).

Here
Po=759
Pn=?
n=2(2011-2030= 2 decades)
r=16.15%

Pn = Po[1 + (r/100)]^n,
Pn=759[1+16.15/100]^2
Pn=1024.041
=1025 No.

Total population of Tatinapara Village will be 1025 in 2030.
Then Per day solid Waste will be Generated 1025×106.74 (Where, 106.74 is average Solid Waste Generation per capita /per day at Tatinapara Village in 2024)
= 109408.5 grams/Per Day in 2030.
= 109.4085 kg/ Per Day in 2030 (Sunil et al., 2016).

4. Different types of Solid Waste Generated in the study area:
In rural areas, various types of solid waste are generated due to diverse human activities and natural processes. These can be broadly categorized into two main types: biodegradable waste and non-biodegradable waste.

1. Biodegradable Waste: Biodegradable Waste is organic in nature and can be decomposed by microorganisms. Common biodegradable waste generated in rural areas includes:

- **Agricultural waste**: Remnants of crops, plant stems, leaves, and other agricultural by-products.
- **Kitchen waste**: Food leftovers, peels, shells, and other organic materials from cooking and eating.
- **Animal waste**: Excreta from livestock, poultry, and other domesticated animals.
- **Garden waste**: Trimmings, cuttings, and fallen leaves from gardens and orchards.

2. Non-Biodegradable Waste: Non-Biodegradable Waste is non-organic and does not decompose easily. It can persist in the environment for long periods, leading to pollution and other environmental issues. Common non-biodegradable waste generated in rural areas includes:

- **Plastic**: Bottles, bags, containers, and other plastic items used for various purposes.
- **Glass**: Discarded bottles, jars, and other glass items.
- **Metal**: Scraps of aluminum, steel, and other metals from tools, utensils, and packaging materials.
- **Rubber**: Footwear, tires, and other rubber products.

- **Electronic waste**: Discarded batteries, wires, and other electronic components (S.B. Mission, 2015).

Table: 3. Different types (Major Types: Biodegradable & Non-Biodegradable) of Solid Waste Generated at the Tatinapara Village per day

Total Weights of Solid Waste Generated in Tatinapara Village	Biodegradable waste	Non-Biodegradable Waste
106.74 kg	64.05 kg	42.69 kg
100%	60 %	40%

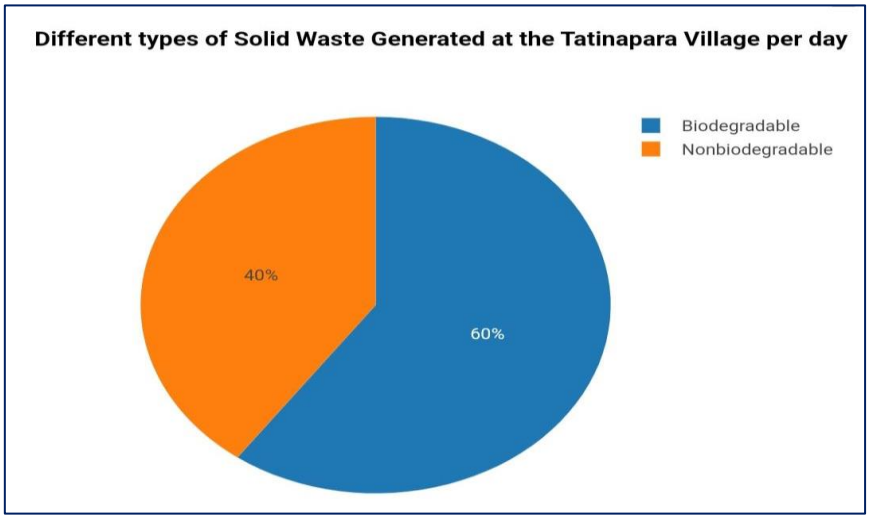

Figure: 7. Different types (Major Types: Biodegradable & Non-Biodegradable) of Solid Waste Generated at the Tatinapara Village per day

5. Impact of solid waste on human health and Environment in the study area:

Solid waste can have significant negative impacts on human health and the environment in rural areas. These impacts can manifest in various ways:

1. Human Health Hazards: Improper disposal of solid waste can lead to the spread of diseases due to the breeding of disease-carrying insects like mosquitoes and flies. Contaminated water sources, soil, and food can result in waterborne and foodborne illnesses. Additionally, open burning of waste can cause respiratory problems and other health issues.

2. Environmental Impact

(i) Soil Pollution: The accumulation of solid waste, especially in agricultural lands, can lead to soil pollution. This can affect soil fertility, structure, and water-holding capacity, ultimately impacting crop growth and yield.

(ii) Water Pollution: Inadequate waste management can lead to the contamination of surface and groundwater sources. This can result in the presence of pathogens, chemicals, and other pollutants in drinking water, posing serious health risks to rural communities.

(iii) Air Pollution: Open burning of waste, especially plastic, generates toxic fumes and greenhouse gas emissions. This can contribute to air pollution, which can lead to respiratory problems, allergies, and other health issues.

(iv) Wildlife and Ecosystem Disruption: Solid waste can negatively impact local ecosystems and wildlife habitats. Discarded waste can attract animals, leading to the disruption of their natural behavior and habitat. Additionally, waste can contaminate soil and water sources, affecting the food chain and overall ecosystem health.

(v) Aesthetic Impact: Uncontrolled solid waste accumulation can lead to unsightly and unhygienic living conditions, affecting the overall quality of life in rural areas (Moharana, 2012).

6. Local Initiatives for solid waste management in the study area:

In rural areas, local initiatives play a significant role in solid waste management. These initiatives often involve community participation, awareness programs, and the adoption of sustainable practices. Some local initiatives for solid waste management in rural areas include:

(i) Community-based Waste Management: This involves the active participation of households, local organizations, and government bodies in waste management activities. It can include source segregation, waste collection, and disposal. Community-led initiatives can also promote awareness campaigns to encourage proper waste disposal and recycling practices.

(ii) Waste Composting and Vermicomposting: Many rural communities adopt composting and vermicomposting techniques to manage biodegradable waste. This not only helps in waste reduction but also produces nutrient-rich compost that can be used as organic fertilizers in agriculture (Dutta et al,2008)

Figure: 8. Waste Composting and Vermicomposting Container

(iii) Waste Recycling and Upcycling: Local initiatives can encourage the recycling of non-biodegradable waste materials like plastic, glass, and metal. These materials can be collected and sold to recycling centers or used for upcycling projects, such as creating new products or repurposing old items.

(iv) Waste-to-Energy Projects: Some rural communities have initiated small-scale waste-to-energy projects, like biogas generation from organic waste. This not only helps in waste management but also provides an alternative source of energy for cooking and lighting.

Figure: 9. Biogas generation Process from Organic waste

(v) Waste Collection and Disposal Facilities: Establishing designated waste collection points and disposal sites can help in maintaining cleanliness and preventing health hazards. Local bodies can collaborate with community members to manage these facilities effectively.

Figure: 10. Waste Collection and transportation vehicle

(vi) Waste Awareness Programs: Organizing workshops, seminars, and campaigns to educate people about the importance of waste segregation, recycling, and responsible disposal can significantly improve waste management practices in rural areas.

(vii) School Involvement: Involving schools in waste management initiatives can help instill good habits and values in children, ensuring a more sustainable future. Schools can organize waste management activities, competitions, and events to promote awareness among students and their families.

Figure:11. Dustbin for Waste Container in school Ground

By implementing and supporting these local initiatives, rural communities can effectively manage their solid waste and contribute to a cleaner, healthier, and more sustainable environment.

7. Government Role for Solid waste management in the study area:

The Government of West Bengal, particularly the local administration in Birbhum district, plays a crucial role in solid waste management in rural areas. Here are some key aspects of their involvement:

(i) Policymakers: The state government has developed policies and guidelines to address solid waste management in rural areas. These policies include the Integrated Solid Waste Management Rules, 2016, which outline the responsibilities of local bodies and provide a framework for implementing waste management practices.

(ii) Financial Supporter: The state government provides financial assistance to local bodies like Panchayats and Municipalities for setting up and maintaining solid waste management infrastructure in rural areas. This support helps in procuring vehicles, equipment, and other resources required for efficient waste collection and disposal.

(iii) Capacity Builder: The government organizes training programs and workshops for rural community members, waste collectors, and local self-governance bodies to enhance their knowledge and skills in solid waste management. This capacity building helps in effective implementation of waste management practices at the grassroots level.

(iv) Awareness and Education: The government promotes awareness campaigns and educational programs in rural areas to encourage proper waste segregation, disposal, and recycling practices. These campaigns often involve local leaders, schools, and community members, aiming to create a sustainable mindset towards waste management.

(v) Infrastructure Development: The state government supports the construction of waste collection centers, composting units, and sanitary landfills in rural areas. This infrastructure is essential for efficient solid waste management and helps in preventing health hazards caused by uncontrolled waste disposal.

(vi) Monitoring and Evaluation: The government monitors the progress of solid waste management in rural areas through regular inspections and evaluations. This helps in identifying areas of improvement and ensures that the implemented strategies are effective in addressing the waste management challenges.

(**vii). Collaboration with NGOs and Private Organizations:** The state government often collaborates with non-governmental organizations (NGOs) and private companies to enhance solid waste management efforts in rural areas. These collaborations can include resource sharing, technical support, and capacity building.

(viii) Integration with Other Development Programs: The government integrates solid waste management with other rural development programs, such as Swachh Bharat Mission-Gramin (SBM-G), which focuses on achieving Open Defecation Free (ODF) status and overall sanitation in rural areas. The Government of West Bengal plays a significant role in promoting and implementing solid waste management in rural areas of Birbhum district. Their efforts include policy development, financial support, capacity building, awareness campaigns, infrastructure development, and monitoring, all aimed at ensuring a cleaner and healthier environment for the rural population.

8. Major Laws, Rules and Regulation of Solid Waste Management in India

In India, several laws, rules, and regulations govern solid waste management. These legislations aim to ensure proper waste disposal, recycling, and overall environmental protection. Some major laws, rules, and regulations related to solid waste management in India include:

(i) The Solid Waste Management Rules, 2016: Replacing the 2000 rules, these updated guidelines emphasize source segregation at the household level, decentralized waste management, and promoting waste-to-energy projects. They also stress the importance of public awareness and community participation in solid waste management.

(ii) The Plastic Waste Management Rules, 2016: These rules were formulated to regulate the generation, collection, storage, transport, processing, and disposal of plastic waste. They aim to reduce plastic waste and promote recycling and reuse. The rules also mandate the establishment of extended producer responsibility (EPR) mechanisms for plastic products.

(iii) The Bio-Medical Waste (Management and Handling) Rules, 1998: These rules focus on the proper management and handling of bio-medical waste generated in hospitals, clinics, and other healthcare facilities. They aim to prevent environmental contamination and health hazards associated with improper disposal of bio-medical waste.

(iv) The Municipal Solid Waste (Management and Handling) Rules, 2000: These rules were introduced to regulate the handling and management of municipal solid waste in India. They provide guidelines for waste segregation, collection, storage, transportation, processing, and

disposal. The rules also emphasize the need for public awareness and community participation in waste management.

(v) The Environment (Protection) Act, 1986: This act empowers the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) to regulate and control environmental pollution, including solid waste management. The act also provides for the establishment of Appellate Authorities for hearing appeals against orders passed by the SPCBs.

(vi) The Swachh Bharat Mission (SBM): Launched in 2014, the Swachh Bharat Mission is a national initiative aimed at achieving cleanliness across India. It focuses on solid waste management, sanitation, and hygiene, with an emphasis on community participation and awareness (Gupta et al, 2016). The Swachh Bharat Mission (SBM), launched in 2014, is a nationwide campaign in India aimed at achieving cleanliness and sanitation across the country. It is one of the largest sanitation drives in history, with the goal of making India open defecation-free (ODF) by 2019.

Some key highlights of the SBM include:

(a) Integrated Approach: SBM focuses on solid waste management, sanitation, and hygiene, targeting both rural and urban areas. It emphasizes the importance of cleanliness in public places, households, and workplaces.

(b) Community base Participation: The mission encourages community participation and ownership in maintaining cleanliness. It promotes the concept of 'Swachhagraha,' or cleanliness ambassadors, who motivate and educate others about the importance of sanitation and hygiene.

(c) Construction of Toilets: A major component of the SBM is the construction of individual household latrines and community toilets, particularly in rural areas. This has significantly contributed to the achievement of ODF status in many regions.

(d) Solid Waste Management: The mission emphasizes proper solid waste management practices, including source segregation at the household level, decentralized waste management, and promoting waste-to-energy projects.

(e) Financial Support: The government has allocated significant funds for the implementation of the SBM, with financial assistance provided to states and local bodies for various sanitation and cleanliness initiatives.

(f) Public Awareness and Education: The mission has launched various awareness campaigns and educational programs to promote the importance of cleanliness and hygiene among citizens, particularly focusing on the importance of using toilets and maintaining personal and environmental cleanliness.

(g) Monitoring and Evaluation: The SBM has a robust monitoring and evaluation system in place, using tools like the Swachh Survekshan (clean survey) to rank and assess the performance of cities and districts in maintaining cleanliness.

(h) Recognition and Awards: The SBM has introduced several awards to recognize the efforts of individuals, institutions, and local bodies in achieving cleanliness and sanitation targets.

The Swachh Bharat Mission has made significant strides in improving sanitation and cleanliness across India. While there is still work to be done, the mission has brought about a positive change in the mindset of people towards cleanliness and hygiene. These laws, rules, and regulations provide a framework for effective solid waste management in India. Implementing and enforcing these guidelines is essential to ensure a cleaner, healthier, and more sustainable environment for the country (Ghosh,2016).

Major problem of the Study Area:

(i) Lack of proper infrastructure is difficult for the management process of waste effectively.

(ii) Limited knowledge and awareness about the importance of proper waste disposal and the negative consequences of improper waste management.

(iii) Seasonal fluctuation of population leading to inconsistent waste generation patterns and challenges in waste management planning

(iv) Common and traditional practices of waste management in the study areas like Open burning and dumping that leads to environmental pollution and health hazards.

(v) Insufficient financial support in the Tatinapara Village can hinder the development and maintenance of waste management systems.
(vi) Insufficient government policies, funding, and regulation in the study area can cause failure in proper waste management.
(vii) Improper waste management practices can have adverse effects on local ecosystems, wildlife, and natural resources in the study area.

Recommendations:

(i) Community base awareness about the importance of waste segregation, recycling, and proper disposal methods will help them to participate actively in waste management initiatives.
(ii) Ensuring the waste collection vehicles are well-maintained and operated by trained staff
(iii) For a regular waste collection system, preferably using biodegradable bags, to collect segregated waste from households and businesses to smooth waste management.
(iv) Encourage the Villagers of Tatinapara to segregate their waste into biodegradable and non-biodegradable categories at the source that will make it easier for waste collectors and recyclers to process and manage the waste.
(v) Explore opportunities to convert waste into energy, such as biogas production from organic waste or waste-to-energy plants in every household of Tatinapara Village and its continuous maintenance for cost cutting in household fuel energy without investment.
(vi) Encourage NGOs to create a sustainable waste management model. That will help in sharing the financial burden and ensuring effective waste management practices in the study area.
(vii) Government project schemes and initiatives for waste management in rural areas should be strictly implemented without any bias in the village.
(viii) As well as awareness of villagers about the negative impact of poor solid waste management practices on human health and Environment in rural areas is always necessary for overcoming this type of problem and development of villages.

Conclusion

From the entire study it is to be concluded that traditional Solid Waste Management practices has been performed in Tatinapara village as socio-economic development condition of the Village is under progress. Most of the villagers are not aware about the Environmental degradation as they have no proper education some of them are aware but they don't adopt new sustainable approach to do. Prime Minister of India Shri Narendra Modi has launched Swachh Bharat Abhiyan SBM Project in 2014 for enhancing sanitation and cleanliness of entire country but in some rural area this programme has not progressed yet. Every Village People should adopt new scientific approaches and practices in solid Waste management for cleaning and conserving the environment instead of traditional approaches.

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