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MUNICIPAL



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Municipal Solid Waste Management

As the population continues to grow, the need for effective waste management becomes increasingly important. Urban areas, in particular, face challenges such as overflowing landfills, plastic pollution, and hazardous waste. By implementing recycling, innovative technologies, and fostering community participation, we can work towards sustainability. Addressing these issues will help preserve resources and protect the environment for future generations. Understanding the different types of waste and their proper disposal methods is essential for achieving more efficient waste management.

WASTE AND ITS CATEGORIES

Waste refers to any material, substance, or by-product that is no longer needed and is usually discarded. It can be classified into various categories based on factors such as origin, physical state, hazard level, and degradability (Fig. 1). Effective categorization and subsequent segregation of waste play a vital role in minimizing its environmental impact.

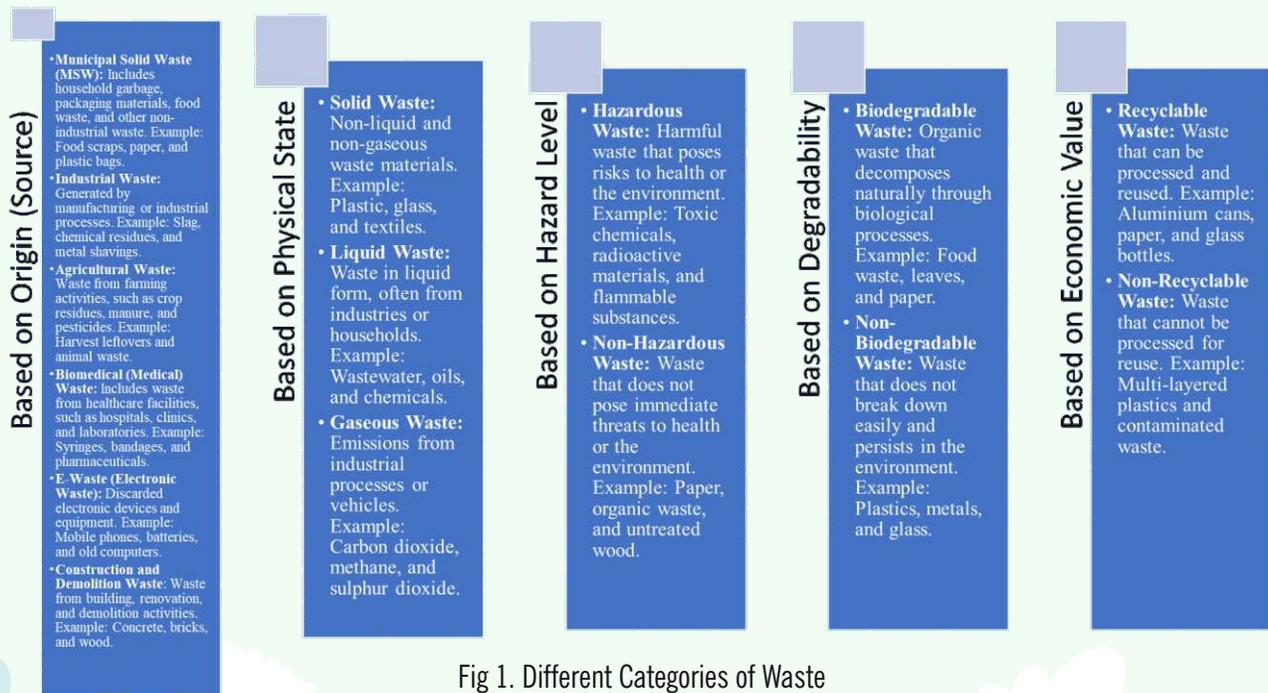


Fig 1. Different Categories of Waste

WASTE MANAGEMENT

Waste management refers to the processes and actions involved in handling waste from its generation to its final disposal. It includes collection, transportation, treatment, recycling, and disposal of waste (Fig 2) in a way that minimizes its impact on the environment and public health.

Key Steps in Waste Management:

- Segregation: Sort waste into different bins based on its type to ensure proper disposal and recycling

- Waste Collection: Gathering waste from households, industries, and commercial entities.
- Transportation: Moving waste to treatment or disposal facilities.
- Processing: Processing waste to recover resources or make it safer for disposal.
- Recycling and Reuse: Converting waste materials into new products or reusing them to extend their lifecycle.

Disposal: Final placement of waste in landfills, incinerators, or other facilities.

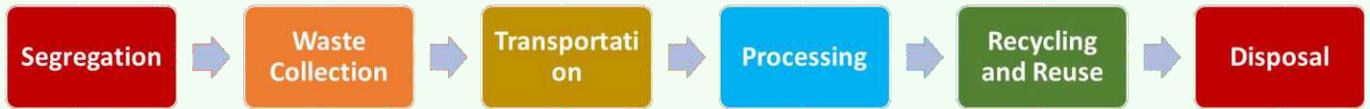


Fig 2. Steps in Waste Management

BENEFITS OF WASTE MANAGEMENT

Effective waste management provides numerous environmental, social, and economic benefits:

1. ENVIRONMENTAL BENEFITS

- **Reduces Pollution:** Proper disposal prevents air, water, and soil contamination.
- **Conserves Natural Resources:** Recycling reduces the need for raw materials, preserving forests, water, and minerals.
- **Mitigates Climate Change:** Reducing methane emissions from landfills and promoting recycling lowers greenhouse gas emissions.
- **Enhances Biodiversity:** Proper management reduces the risk of habitat destruction caused by waste dumping.

2. HEALTH AND SAFETY BENEFITS

- **Prevents Disease Spread:** Proper waste disposal reduces exposure to hazardous substances and breeding grounds for pests like mosquitoes and rodents.
- **Protects Public Health:** Reduces the risks associated with toxic waste exposure, particularly for communities near landfills.

3. ECONOMIC BENEFITS

- **Job Creation:** Recycling, composting, and waste treatment industries create employment opportunities.
- **Energy Savings:** Recycling materials like aluminium and paper consumes less energy than producing them from raw materials.
- **Cost Reduction:** Efficient waste management systems reduce the need for expensive cleanup operations and mitigate environmental damage costs.

4. SOCIAL BENEFITS

- **Improves Quality of Life:** Clean environments contribute to better living conditions.
- **Promotes Awareness:** Encourages responsible behaviour toward resource use and waste reduction.
- **Encourages Community Participation:** Engages individuals and communities in sustainable practices, fostering a sense of responsibility.

UNDERSTANDING THE CONCEPT OF INTEGRATED SOLID WASTE MANAGEMENT

Integrated Solid Waste Management (ISWM) introduces a hierarchical approach to waste management with the goal of reducing waste disposal while promoting resource conservation and efficiency. It aligns closely with the 3R principles—reduce, reuse, and recycle—prioritizing these practices over other waste processing methods. By following these principles, the volume of waste requiring disposal is minimized, reducing associated public health and environmental risks. Both ISWM and the 3R approach emphasize maximizing resource recovery throughout all stages of waste management. The ISWM hierarchy ranks waste management methods based on their environmental, economic, and energy impacts. At the top is source reduction or waste prevention, which includes reuse (Fig 3). This is followed by recycling and composting organic waste to recover materials. For waste that cannot be reduced or recycled, energy recovery is an option. The least desirable option is disposal in sanitary landfills. The most important feature of ISWM is selecting the appropriate waste management system and technology based on the hierarchy and local conditions.

Policies And Rules Related To Waste Management In India

- Solid Waste Management Rules, 2016

EFFECTIVE STRATEGIES FOR MANAGING HOUSEHOLD WASTE

The most effective way to manage household waste begins with reducing consumption, particularly of single-use items. Opting for reusable products can significantly decrease the amount of waste generated at home. Another key approach is reusing items, whether for the same purpose or alternative uses, which helps minimize household waste production. Source segregation follows as the next crucial step after reducing and reusing. This involves separating waste at the source, typically by dividing biodegradable or wet kitchen waste from dry waste. Source segregation is vital as it enables waste managers to handle waste more efficiently. Using separate bins for storing segregated waste is essential for this process to be successful Table 1.

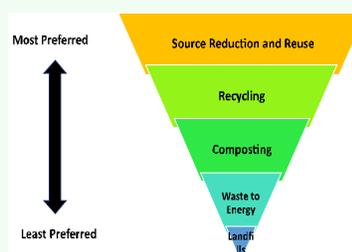


Fig 3. Integrated Solid Waste Management (ISWM) Hierarchy

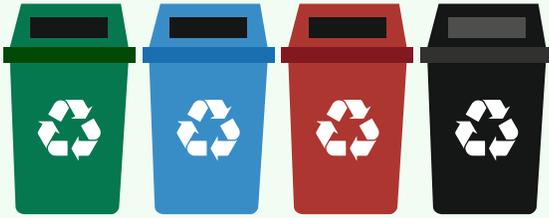


Table 1: A list of different types of waste to be segregated and disposed of in various color-coded bins

GREEN BIN	BLUE BIN	RED BIN	BLACK BIN
<ul style="list-style-type: none"> • Vegetable/Fruit Peels • Stale Food • Egg Shells • Meat/Fish Bones • Overripe Fruits • Tea Bags • Tree Leaves • Flowers • Garlands etc. 	<ul style="list-style-type: none"> • Plastic Covers • Bottles/Boxes • Toffee/Chips Wrappers • Newspapers • Magazines • Cardboard • Pizza Boxes • Tetra Packs • Files/Papers • Metal Cans • Glass/Glass Bottles • Jars • Plates etc. 	<ul style="list-style-type: none"> • Sanitary waste • Diapers 	<ul style="list-style-type: none"> • Pesticides • Insecticides • Mosquito Repellents • Portable Gas Cylinders • Used Batteries • Expired Medicines • Phenyl/Acid • Bleaching Agents • Damaged Electronic Wires (Wrapped separately in paper) etc.

Source: <https://www.youtube.com/watch?v=NeEJIDZasrY>

Following are the other measures for managing different kind of household wastes

MANAGING WET KITCHEN WASTE

Wet kitchen waste, which primarily consists of food scraps, vegetable peels, and fruit remains, can be effectively managed through composting. This organic waste can be converted into nutrient-rich manure, which is beneficial for gardening and agriculture. Composting methods such as vermicomposting, aerobic composting, or using compost bins at home are sustainable options to reduce the amount of waste sent to landfills. This not only minimizes environmental pollution but also promotes a circular economy by converting waste into a valuable resource.

MANAGING DRY WASTE

Dry waste includes materials such as paper, plastic, glass, and metal. Effective segregation at the source is key to managing this type of waste. Recyclable materials can be handed over to local recycling programs or scrap collectors, while non-recyclable items should be disposed of responsibly or given to waste collectors appointed by Urban local bodies. Reducing the use of disposable items and opting for reusable or biodegradable alternatives can significantly decrease dry waste generation.

MANAGING DOMESTIC HAZARDOUS WASTE

Hazardous domestic waste includes items such as cleaning agents, paints, pesticides, and expired medications. These materials require careful handling and disposal to prevent environmental contamination and health hazards. Designated hazardous waste collection centers or waste collectors appointed by local authorities are ideal for safe disposal. Moreover, reducing the use of toxic substances and opting for eco-friendly alternatives can help minimize hazardous waste generation at the source.

AN OVERVIEW OF CHANDIGARH'S MUNICIPAL SOLID WASTE MANAGEMENT AND INITIATIVES BY CHANDIGARH ADMINISTRATION FOR THE EFFICIENT SOLID WASTE MANAGEMENT

- Ban on single use plastic items.
- 100% waste is collected door to door from households in four categories viz Dry, Wet, Sanitary and Domestic Hazardous Waste.
- GPS enabled Compartmentalized vehicles for collection of Municipal solid waste (separate compartments for Wet, Dry and Household Hazardous Waste).
- All the green belts are having composting pits to use the horticulture waste within the green belt.
- 03 (Nos.) Material Recovery Facilities in U.T. Chandigarh (75 tonnes per shift each)(Fig 4).



Fig 4: Material Recovery Facility

Processing Facility

RDF -200 TPD

Compost – (120 + 300) TPD

Horticulture - (30 + 32 + 90) TPD

Bio Methanation - 5 TPD

Coconut Shell - 10 TPD

All collected dry waste (approximately 116 TPD, including recyclables and coconut shell waste), along with sanitary waste (around 0.5–1 TPD) and domestic hazardous waste (about 0.1 TPD), is sent for processing at Material Recovery Facilities (Fig 5).



Fig 5: Solid Waste Processing Plant



- Approximately 168 TPD of wet waste is collected. There are two composting facilities with capacities of 120 TPD and 300 TPD, respectively. However, since the wet waste generation is only 168 TPD, only the 300 TPD facility is currently operational. This facility is equipped with a Leachate Treatment Plant (LTP) with a capacity of 120 KLD. The compost produced is utilized by MCC (Fig 6).



Fig 6: Wet Waste Processing Plant



- Dried horticultural waste is shredded and combined with dry waste to produce RDF. Pruned horticultural waste is processed at a Horticulture Processing Plant with a capacity of 30 TPD to manufacture bio-briquettes. Additionally, horticultural waste generated in parks and green belts is managed in-situ, including processing at 104 aerobic compost pits (Fig 7).



- Sanitary waste, including used diapers, sanitary towels, and napkins, is collected from MRFs and sent for processing at the authorized Biomedical Waste Treatment Facility, M/s Alliance Envirocare Company Pvt. Ltd.
- Domestic hazardous waste, such as discarded paint drums, pesticide cans, CFL bulbs, and tube lights, is collected by M/s RE-Sustainability Ltd. from MRFs and properly disposed of at Nimbua Greenfield (Punjab) Ltd., Derabassi.

Fig 7: Horticulture Waste Processing Plant





- Coconut shell waste is separately processed, shredded, and mixed with RDF for use as fuel (Fig 8).



Fig 8: Coconut shell waste processing

At present, a new machine for segregating and processing mixed waste is installed and has been operational since 04.12.2024. The issue of leachate generation is being actively managed, with necessary corrective measures in place, including the lifting and treatment of leachate at the LTP. As the mixed waste processing machine remains operational, the disposal of unprocessed mixed waste has been discontinued, significantly reducing leachate generation from mixed waste (Fig. 9).



Fig 9: Mixed waste segregating and processing machines

- Out of the 168 TPD of wet waste generated, approximately 7.5 TPD of compost and 28 TPD of inerts are produced after processing. The compost is utilized by MCC in various parks and gardens. Additionally, from the 120 TPD of dry waste processed, around 95 TPD of RDF and 8 TPD of inerts are generated. The RDF produced is supplied to the cement manufacturing unit, M/s Ambuja Cement, Darlaghat, District Solan, HP.

Status of Solid Waste Management

- In Chandigarh, 500 TDP (Tons Per Day) of waste has been generated, all of which has been successfully collected and processed by the Municipal Corporation of Chandigarh (MCC). This reflects the city's strong waste management system and commitment to sustainability.
- **Mixed waste plant:** In order to process mixed waste of around 70-80 TPD collected by MCC, they have installed new machines for segregation of mixed waste into wet waste and dry waste. The mixed waste plant is functional from 04.12.2024. The segregated waste is then sent for processing to respective processing plants. The installation of these machines marks a significant step towards sustainable waste management and a cleaner, greener Chandigarh.





Fig 10: Mixed waste segregating and processing machines



Mission LiFE Waste Management Practices

Say No to Single Use Plastic

- Use cloth bag for shopping instead of plastic bags
- Reuse glass containers/packaging plastic items as storage boxes
- Participate in and mobilize participation for clean-up drives of cities and water bodies
- Prefer using non-plastic ecofriendly cutlery during gatherings and events
- Use menstrual cups instead of sanitary napkins
- Use recycled plastic over virgin plastic, wherever possible
- Use steel/recyclable plastic lunch boxes and water bottles
- Cut the packaging bags used for milk, buttermilk, etc., only partially to avoid plastic bits from mixing into biodegradable waste
- Opt for bamboo toothbrushes and neem combs

Reduce Waste

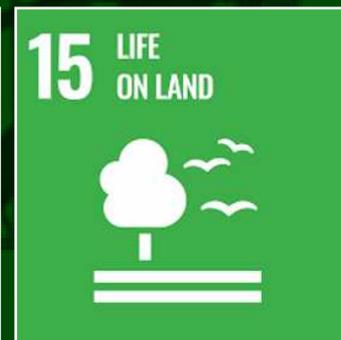
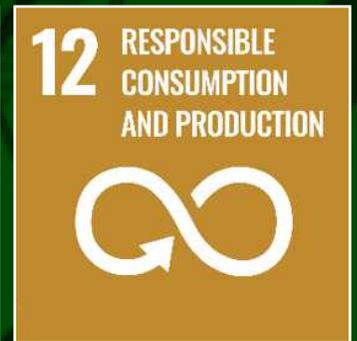
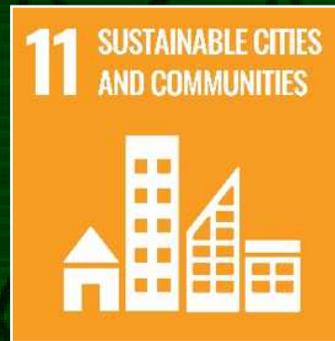
Contribute cattle waste, food waste, and agricultural waste to biogas plant (provided under GOBARdhan)

- Practice segregation of dry and wet waste at homes
- Use agricultural residue, animal waste for composting, manuring and mulching
- Recycle and reuse old newspapers and magazines
- Feed unused and uncooked vegetables leftovers to cattle
- Set printer default to double-side printing
- Repair, reuse and recycle old furniture
- Buy paper products made from recycled paper
- Donate old clothes and books
- Do not discard waste in water bodies and in public spaces
- Do not let pets defecate in the public places

Reduce E-waste

- Repair and use electronic devices
- Over discarding the devices
- Discard gadgets in nearest recycling units
- Use rechargeable lithium cells
- Prefer cloud storage over a pen drive / hard drive

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