TB-ICN: 388/2025

General Guidelines for Laboratory Waste Management

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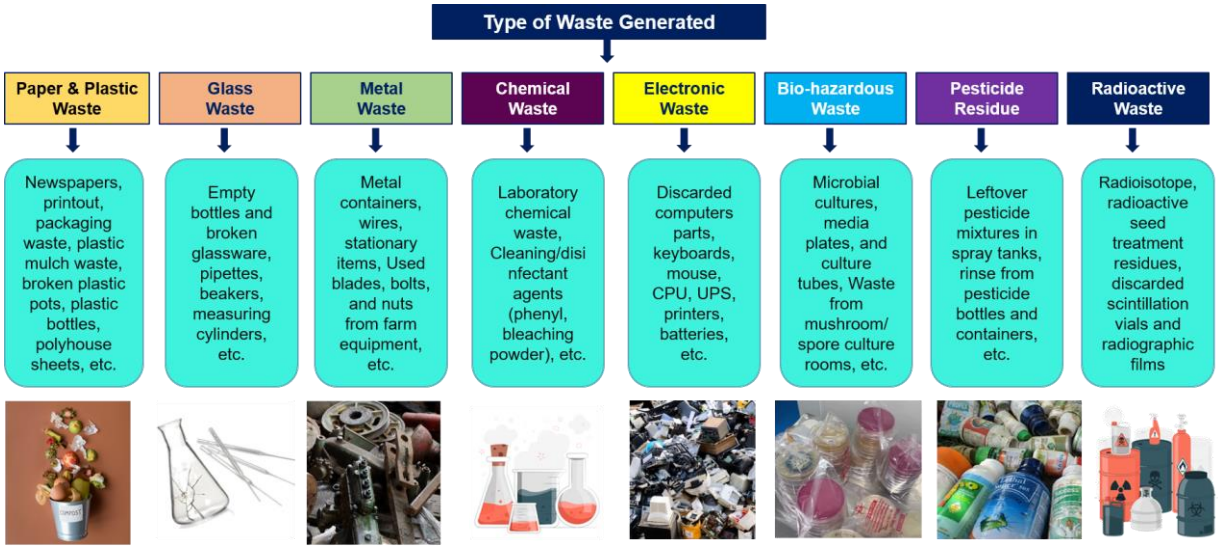
General Guidelines for Laboratory Waste Management

The Division of Environmental Sciences at ICAR-Indian Agricultural Research Institute (ICAR-IARI) in New Delhi adheres to comprehensive waste management protocols to ensure the safe and environmentally responsible disposal of laboratory waste, including paper, broken glassware, empty plastic and chemical bottles.

Different Waste Generation in Labs and Field Experiments



Management of Paper & Plastic Waste

- General wastes are classified into two categories.
  1. Biodegradable (paper waste)
  2. Non-biodegradable (plastic, metals & glass waste)
- Biodegradable and non-biodegradable wastes generated from laboratories and rooms are segregated at the production site and disposed of in the different coloured dustbins.
- These coloured dustbins are installed on each floor for proper waste management.
- This waste is subsequently collected by the Sweepers and disposed of at the primary waste collection center set up by the Municipal Corporation of Delhi for final disposal in the Pusa Campus.

Dustbin colour code for waste management

- **Green dustbin**: Biodegradable waste (wet waste), e.g., food waste, vegetable and fruit peels, food scraps, garden waste, tea leaves, etc.
- **Blue dustbin**: Recyclable waste (Dry waste), e.g., Paper, cardboard, plastic, metal, cartons, thermocol, etc.

- **Black or Grey dustbin**: Non-Recyclable/Reject waste, e.g., Sanitary waste, used tissue papers, diapers, broken glass/ceramics, contaminated plastics, etc.

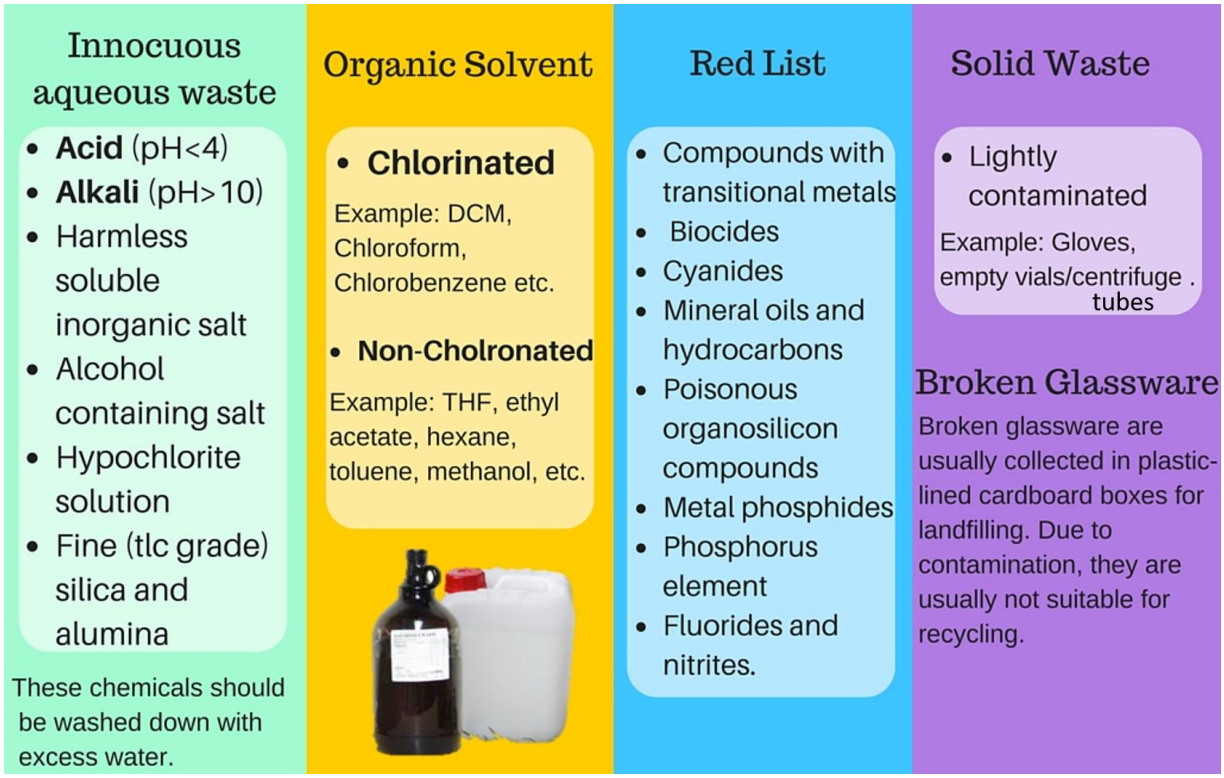
Management of Metal Waste:

- It is a non-biodegradable waste
- It is collected in the separate **red-coloured containers** as designated by the Municipal Corporation of Delhi.
- These coloured dustbins are installed on each floor for proper waste management.
- This waste is subsequently collected by the Sweepers and disposed of at the primary waste collection center set up by the Municipal Corporation of Delhi for final disposal.

Management of Chemical Waste

- **Label all chemicals** clearly with their full chemical names
- **Segregate waste** into categories: Acidic waste (e.g., HCl, HNO_3), solvent waste (halogenated and non-halogenated solvents), oxidizers, reactive chemicals & heavy metal-containing waste
- **Do not mix incompatible chemicals**. For example:
  - Never mix **acids with solvents**.
  - Separate **halogenated** (chloroform) and **non-halogenated solvents** (ethanol).
  - Keep **acids** away from **bases**.
- Store away from heat, sunlight, or ignition sources.
- Keep **volatile solvents** in **fume hoods** or ventilated cabinets.
- **Neutralization of dilute acids/bases** in the lab (e.g., using $NaHCO_3$ for HCl).

- Use of sawdust for liquid chemicals management
- Waste must be sent to a **certified treatment, storage, and disposal facility (TSDF)**.



*Dichloromethane (DCM), Tetrahydrofuran (THF)

Management of E-waste

- E-waste refers to discarded electrical or electronic devices such as computers, mobile phones, televisions, batteries, and other electronic appliances. Proper management is essential due to the presence of toxic substances such as lead, mercury, and cadmium, as well as valuable metals like gold and copper.
- E-waste collected at the Division, such as computers, monitors, batteries, and circuit boards, is collected separately in a specific designated area or bins to prevent damage or leakage.
- These items should not be disposed of in the general trash.
- Discarded batteries are returned or collected by suppliers.
- Suppliers or companies producing electronic appliances are responsible for the collection of expired, damaged, or faulty equipment under the Extended Producers' Responsibility (EPR).

Biowaste & Microbial Contaminated Waste

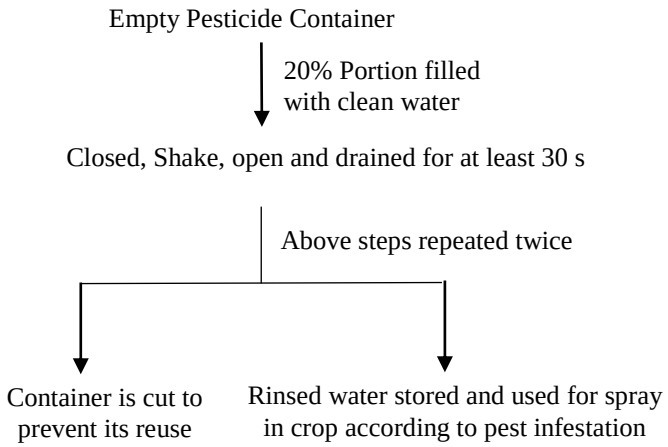
- Waste generated from microbial cultures and biotechnological experiments that is contagious is properly packed in specially designed bags and stored in isolated areas.
- Autoclaving or UV treatment or chemical disinfection of non-sharps biowaste is carried out at the division.
- Sharps may require chemical decontamination if autoclaving is unsuitable.
- The institute also has established procedures for the collection and disposal of hazardous laboratory waste, including chemical and biological materials.
- A bio-incinerator with a capacity of 50 kg/hour has been installed at the Division of Plant Pathology to manage such waste safely.

Management of Radioactive Waste

- The Institute and the Division follow the Atomic Energy Regulatory Board (AERB) guidelines for disposal of the radioactive waste through the AERB-appointed Radiological Safety Officer (Room no 311, NRL building).
- The Institute's Radiological Safety Office oversees the procurement of radioisotopes and biomolecules for research purposes from BRIT after obtaining the formal AERB approvals. It is also responsible for maintenance and operation of the Gamma (Co-60) Irradiation Facility at the Institute housed in the NRL building.
- RSO ensures the regular collection and safe disposal of radioactive waste in designated protected areas, maintaining compliance with safety regulations.

Pesticide Residue Management

Disposal of containers: The pesticide container should be very durable to offer adequate protection to the pesticide product. It should also be disposable after the pesticide has been taken from the container. In this context, the triple-rinse (or pressure rinse) approach is used to remove 99.99% of the pesticide from the container.



Decontamination of application equipment: The nozzle can become clogged if the sprayer is not washed immediately after use. Different reagents are required to clean the sprayer, depending on the type of pesticide used.

1. For organophosphorus pesticides and carbamate pesticides, first, the sprayer should be washed with a mixture of 100 g washing soda, 20 g detergent powder, and 50 g bleaching powder in 10 L of water. Allow one the mixture to stand for 1 hour and then wash it with water.
2. For organochlorine pesticides, the above approach should be adopted. Use ammonium hydroxide instead of bleaching powder.
3. For oil-soluble formulations, washed with 500 ml kerosene, followed by washing rinsing with some detergent and oil-soluble formulations, washed with 500 ml of kerosene, followed by washing with some detergent, and then washing and rinsing with some detergent, and then washing with water.

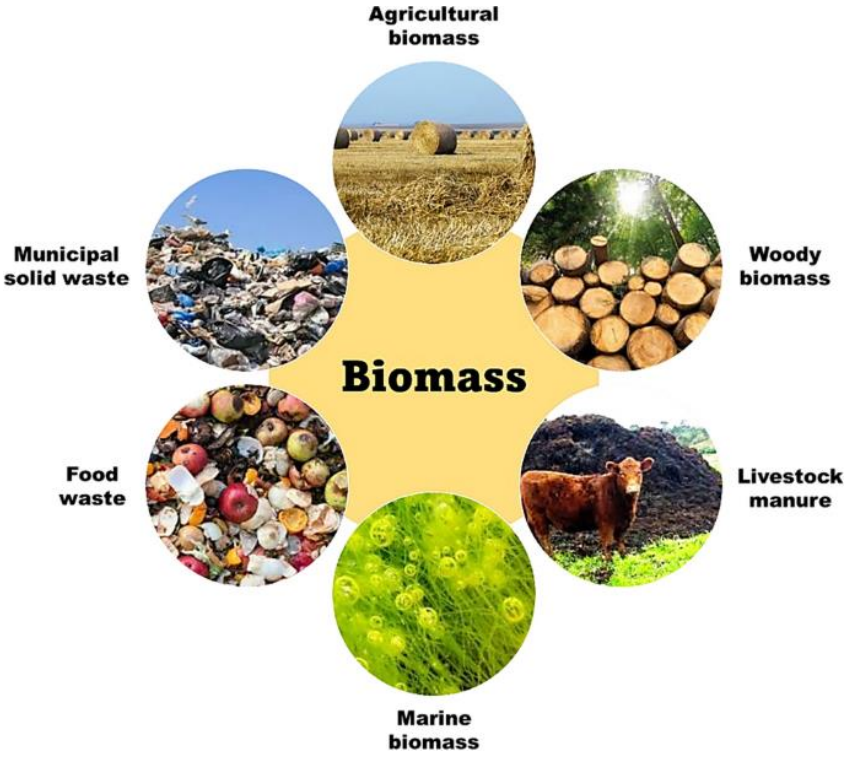
Management of plastics and fertilizer bags in field conditions

- Plastics and fertilizer bags collected from the field are disposed of at a designated place.

- This waste is subsequently collected by the sweepers and disposed of at the primary waste collection center set up by the Municipal Corporation of Delhi for final disposal.

Field Waste or Biomass Residue

- Field waste such as organic waste from agricultural, forestry, or laboratory activities, such as plant residues, animal manure, or food processing waste, is collected in a designated area for further disposal.
- This biodegradable waste is further used for biogas production, bioplastic production, and several other purposes.



Plastic waste categories

Laboratory Safety symbols

For more detail information, visit the following websites

- Comprehensive rules for handling municipal solid waste by **MoEFCC** (Ministry of Environment, Forest and Climate Change); Link: https://moef.gov.in/en/legislations/environment/swm-rules-2016/
- Technical guidance and SOPs for handling different waste types by **CPCB** (Central Pollution Control Board); Link: https://cpcb.nic.in/waste-management/
- Protocols for segregation, collection, treatment, and disposal of medical waste by **MoHFW** (Ministry of Health and Family Welfare); Link: https://main.mohfw.gov.in/sites/default/files/6957401451474190211_0.pdf
- Urban waste processing and conversion to energy or resources by Ministry of Housing and Urban Affairs (MoHUA); Link: https://sbmurban.org/
- Guidelines on biomedical and healthcare waste management by WHO; Link: https://www.who.int/publications/i/item/9789241548564
- E-Waste (Management) Rules, 2022 by Central Pollution Control Board (CPCB); Link: https://cpcb.nic.in/rules-6/
- E-Waste EPR Portal; link: https://eprewastecpcb.in/#/
- Environmental Compensation (EC) Guidelines under E-Waste (Management) Rules, 2022; Link: https://eprewastecpcb.in/assets/PDF/EC-Guidelines-under-E-Waste-Management-Rules-2022-09.09.24.pdf
- Modern Agricultural Waste Management Strategies-SWITCHON; Link: https://www.switchon.org.in/wp-content/uploads/2024/12/Waste-to-Wealth-Modern-Agricultural-Waste-Management-Strategies.pdf

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Year of Publication: 2025