

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Chandigarh, The ‘City beautiful’ designed by famous French Architect, Le Carbusier is known for its unique architecture and well planned landscaping. It derives its name from a temple of ‘Chandi’ located in the vicinity of the site selected for the city. It is a modern city housing the Capital of two States Punjab and Haryana and the seat of ‘Union Territory’ Administration. Bounded on two sides by two seasonal rivulets, the northern edge of the city is the Capital Complex against the panoramic backdrop of the Shivalik hills. A harmonious blend of buildings, trees and other landscape elements, with the beautiful backdrop of the Shivalik hills, enhances its aesthetic value. The most fascinating feature of the City’s landscaping is perhaps the Tree plantation along avenues, open spaces, green belts and around building complexes. A number of beautiful avenues with conspicuous tree species, well-wooded forests along the periphery of city, ‘Sukhna Lake’ against the backdrop of Lake Reserve Forests, green belts running across the length and breadth of the city and a beautiful ‘Sukhna Wildlife Sanctuary’ on its periphery, further enhance the ecological, environmental and aesthetic richness of the city.

The population of Chandigarh is 9,00,635 Lakh (Males 5,06,938 and Females are 3,93,697).

1.2 PROJECT OBJECTIVES

The objectives of the project “Inventorization of Unit Wise Hazardous Wastes Generation in Chandigarh” are:

1. To upgrade the database on hazardous waste generating industrial units in Chandigarh as per amended Hazardous Waste (Management, Handling & Transboundary Movement) Rules-2008.
2. To identify and classify industries based on type and category of hazardous waste generation; and
3. To estimate the unit-wise quantum of hazardous waste generation

1.3 SCOPE OF WORK

In order to achieve the above objectives the following is the scope:-

- (i) To upgrade the database on hazardous waste generating industrial units in Chandigarh;
- (ii) To upgrade the list of industries based on generation, type and category of hazardous wastes;
- (iii) To assess the hazardous wastes management practices followed by the Industries;
- (iv) To estimate the unit wise quantum of hazardous waste generation and categorization of hazardous wastes as per the Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008;
- (v) To suggest feasible waste management strategy in accordance with Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 for hazardous waste generating units; and
- (vi) To prepare action plan for implementation of the proposed strategy.

1.4 METHODOLOGY

In the year 2003 the first inventorization of hazardous waste generated units was carried out by a door to door survey, and category-wise quantum of hazardous waste generated was sent to the Supreme Court Management Committee. This inventory was being updated every year, conjoining it with the Common Consent Management and Authorization. The Rules were amended by the Ministry vide Notification No. SO 2265(E) dated 24th September, 2008 in which they required a complete fresh survey.

Door to door Inventorization was carried out along with the data provided by the units when they have applied for renewal of consent to operate and regular returns vis-à-vis quantum of hazardous waste generated and disposed of. Also units were identified which shut down their operations. These units have been deleted from the list.

1.5 ABOUT THE REPORT

This report includes the following major components of the study

- Total number of hazardous waste generating units and their distribution;
- Quantity of maximum hazardous waste generated by individual units; in tonnes per annum (TPA)
- Present hazardous waste management practices followed by the units;
- Proposed hazardous waste management plan for implementation in Chandigarh.

CHAPTER 2 INDUSRIES IN U.T. CHANDIGARH

2.1 GEOGRAPHICAL LOCATION OF INDUSTRIES

Majority of industries in Chandigarh are located in the designated industrial estates as shown in the map given below:- as

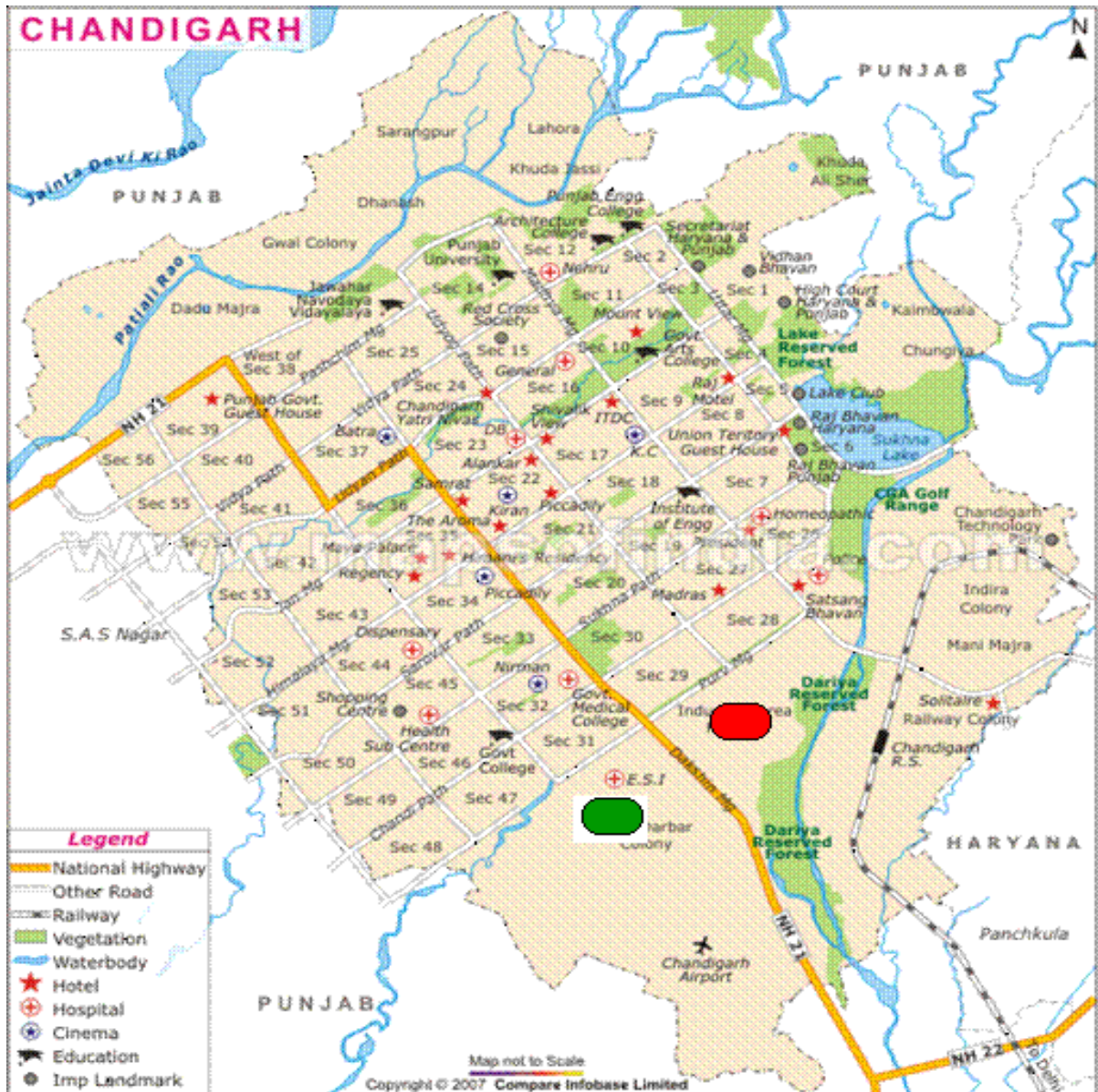


Figure 1 : Distribution of industrial area in Chandigarh

2.2 CLASSIFICATION OF INDUSTRIES

As per latest inventory carried during 2008-09, there are approximately 2000 units are operational in U.T., Chandigarh. Out of 2000 units 237 are generating hazardous waste. The details of industrial statistics are as per Table 1 below:-

Table No.1: Industrial Statistics

| S. No. | Item | No. of units |
|--------|-----------------------------------------------------------------------------------------------------|--------------|
| | | 2008-09 |
| 1. | Total No. of Industries | 2000 |
| 2. | No. of hazardous waste generating units | 237 |
| 3. | No. of HW units applied for authorization. | 237 |
| 4. | No. of HW generating units for which authorization granted. | 157 |
| 5. | No. of HW generating units for which authorization is under process. | 80 |
| 6. | No. of HW industrial units not applying for authorization/or for renewal. | NIL |
| 7. | No. of HW industrial units in operation without valid authorization. | 80 |
| 8. | No. of HW units for which closure directions issued since October 14, 2003 | 13 |
| 9. | No. of HW units for which closure directions revoked since October 14, 2003 | 10 |
| 10. | No. of HW generating units closed since October 2003 by CPCC | 03 |
| 11. | No. of HW units displaying information at the entrance in the prescribed size of the Display Board. | 237 |

CHAPTER 3

HAZARDOUS WASTE GENERATION IN U.T. CHANDIGARH

3.1 IDENTIFICATION OF HAZARDOUS WASTE GENERATING INDUSTRIES

Once the industries in Chandigarh were classified into various sectors and sub sectors, the non hazardous waste generating sector and sub-sectors were excluded based on the door-to-door survey carried out in industries. **Table 2** provides a list of identified potential hazardous waste generating sector/sub sector in Chandigarh.

Table 2: Potential Hazardous Waste Generating Sectors and Sub-sectors

| S. No. | Industrial Sector | Industrial Sub Sector | |
|---------------|--------------------------|------------------------------|-------------------------------------------|
| 1. | Ceramics | 1.1 | Ceramics products |
| 2. | Chemicals | 2.1 | Soap & Detergents |
| | | 2.2 | Ink formulation/dispersion |
| | | 2.3 | Pharmaceutical formulation |
| 3. | Machinery & Fabrication | 3.1 | Machining & Fabrication |
| 4. | Metal Finishing | 4.1 | Wire Drawing |
| | | 4.2 | Electroplating |
| 5. | Automobile servicing | 5.1 | Washing |
| | | 5.2 | Washing & Maintenance (Vehicle Servicing) |
| 6. | Battery | 6.1 | Plate Manufacturing |
| | | 6.2 | Assembly |
| 7. | Zinc | 7.1 | Production of zinc oxide |
| | | 7.2 | Production of zinc sulphate |
| 8. | Services | 8.1 | Repairing of miscellaneous items |
| 9. | Food | 9.1 | Bottling of Beverages |
| | | 9.2 | Packaged Drinking water |
| 10. | Waste treatment | 10.1 | Composting & Incineration |
| 11. | Aluminium | 11.1 | Aluminium Utensils mfg. |
| 12. | Iron & Steel | 12.1 | Rolling Mills |
| 13. | Brass | 13.1 | Brass casting |
| 14. | Polymer Processing | 14.1 | PVC pipe mfg |
| | | 14.2 | PVC cable mfg |
| | | 14.3 | Plastics Products |

3.2 DEVELOPMENT OF WASTE GENERATION FACTOR

Once the surveys were conducted, the data/ information collected were analysed to identify the hazardous waste generating industrial sectors in the various industrial areas/estates in Chandigarh. **Figure No.3.1** shows the "Decision Making Tree" used for identifying the hazardous waste generating units. The relevant portion of Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 is attached as Annexure 2.

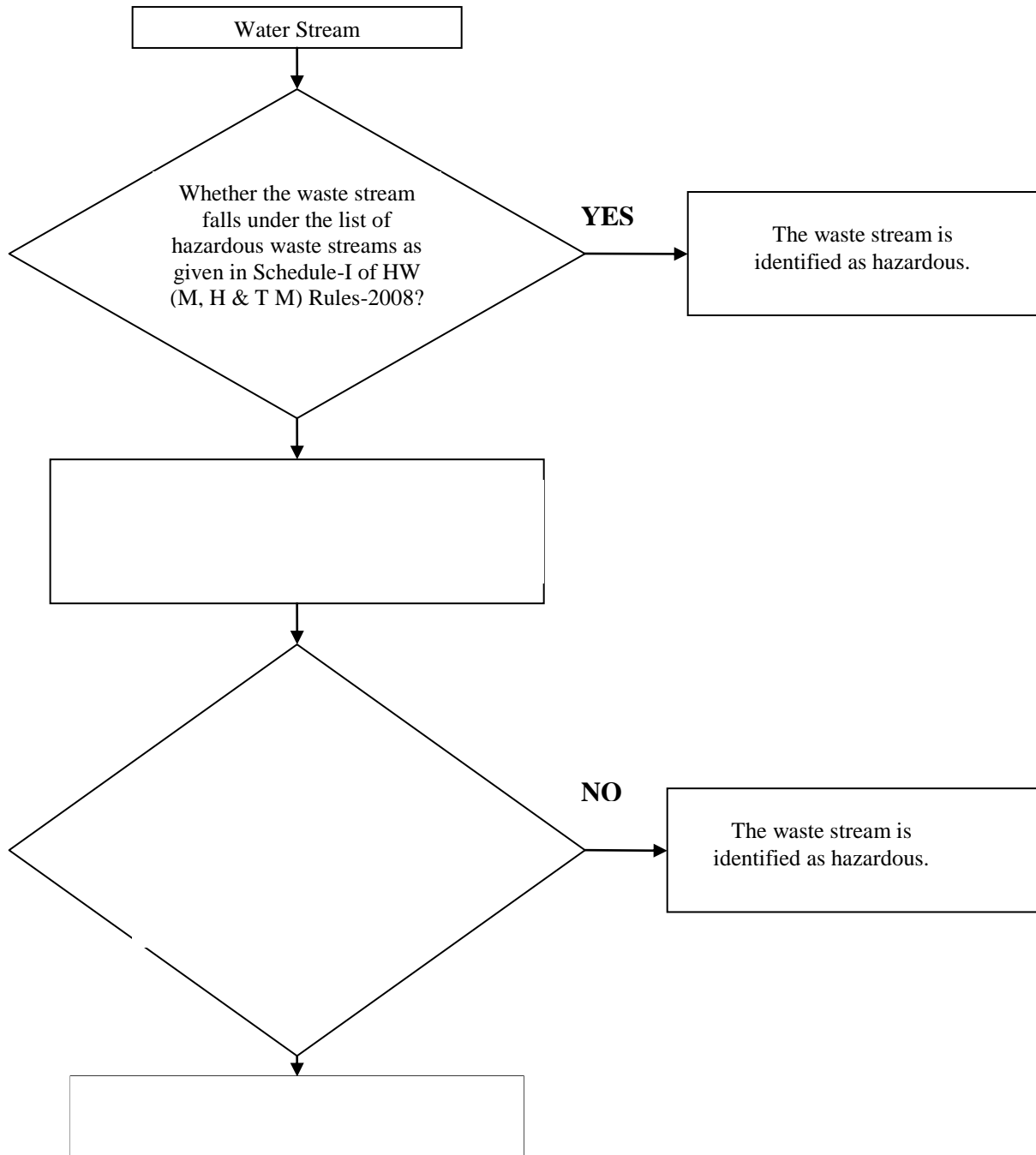


Fig 3.1 : Decision making tree for identification of hazardous waste

3.3 HAZARDOUS WASTE GENERATING UNITS

Industry wise inventory of Hazardous Waste generating units, quantum of hazardous waste generated and its sub categories such as landfillable, Incinerable & recyclable in Chandigarh is as per Table No.3 below.

Table No.3 Category wise no of units & quantity of hazardous waste produced by different types of units

| S No | Hazardous Waste (HW) generating Process as per Schedule 1 | Cat. No. | Type of Hazardous Waste | No. of units | Qty of Hazardous Waste Gen (T/yr) |
|------|----------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------|--------------|-----------------------------------|
| | | | | 2008-09 | 2008-09 |
| 3 | Cleaning emptying and maintenance of Petroleum oil storage tanks including ships | 3.3 | Sludge Filters contaminated with oil | 1 | 0.17 |
| 5 | Industrial operations using mineral/synthetic oil as lubricant in hydraulic systems or other applications | 5.1 | Used/spent Oil | 72 | 809.63 |
| | | 5.2 | Wastes/Residues containing Oil (Sludge) | 51 | 25.85 |
| 6 | Secondary production and / or industrial use of zinc | 6.1 | Sludge and filter cake arising out Zinc Sulphate Production | 2 | 80.00 |
| | | 6.2 | Zinc fines/dust/ash/skimming (dispersible form) | 7 | 36.00 |
| | | 6.3 | Other residues from processing of zinc ash/skimming | 1 | 0.05 |
| | | 6.4 | Flue gas dust & other particulates | 1 | 0.24 |
| 9 | Secondary production of Lead | 9.1 | Lead slag/lead bearing residues | 3 | 2.72 |
| | | 9.2 | Lead ash/Particulate from flue gas | 3 | 2.11 |
| 12 | Metal surface treatment, such as etching, staining, polishing, galvanizing, cleaning, degreasing, plating, etc | 12.1 | Pickling Acid Residues | 3 | 5520.00 |
| | | 12.2 | Alkali residues | 1 | 60.00 |
| | | 12.3 | Spent bath/sludge containing sulphide, cyanide & toxic metals | 1 | 1.20 |
| | | 12.5 | Phosphate sludge | 1 | 0.06 |
| | | 12.8 | Plating metal sludge | 1 | 0.07 |
| 13 | Production of Iron & steel including other ferrous alloys (electric furnaces, steel rolling & finishing mills, Coke oven & by product plant) | 13.1 | Sludge from acid recovery unit | 2 | 600.13 |
| 16 | Production of Caustic soda and chlorine | 16.6 | Phosphating Sludge | 1 | 0.03 |

| | | | | | |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------|-----|-------------------------|
| 18 | Production of nitrogenous and complex fertilizers | 18.1 | Acid containing residues | 1 | 3.65 |
| 20 | Production and / or Industrial use of solvents | 20.3 | Distillation Residues | NIL | NIL |
| 21 | Production and /or industrial use of paints, pigments, lacquers, varnishes, plastics & inks | 21.1 | Wastes and residues | 48 | 2.88 |
| | | 21.2 | Fillers Residues | 3 | 0.64 |
| 28 | Production / formulation of drugs / pharmaceuticals & health care products | 28.2 | Off Specification products | 2 | 0.06 |
| | | 28.3 | Date – expired, discarded and off specification drugs/medicines | 2 | 0.06 |
| 34 | Purification and treatment of exhaust air, water & waste water from the processes in this schedule & common industrial treatment plants (CETP's) | 34.2 | Spent ion exchange resin containing toxic metals | 1 | 0.04 |
| | | 34.3 | Chemical sludge from waste water treatment | 119 | 2,559.31 |
| | | 34.4 | Oil & Grease Skimming residues from Industries specific ETP | 6 | 4.25 |
| | | 34.5 | | 1 | 0.01 |
| 36 | Hazardous waste treatment processes, e.g. incineration, distillation, separation & concentration techniques | 36.1 | Sludge from Wet Scrubbers | 8 | 5.90 |
| | | 36.2 | Ash from Incineration of Hazardous Waste, | 1 | 0.12 |
| | | 36.3 | Flue Gas Cleaning residues | 1 | 0.06 |
| | | | TOTAL | | 9,736.08 T/yr)** |

**** Out of the total 9736.08 T/yr of hazardous waste generated approx 5793.67 T/yr is recyclable and the remaining 3942.43 T/yr is disposed of to the Treatment Storage & Disposal Facility (TSDF) at Derabassi (Punjab).**

(Refer Bar Graph no.1 & 2 on Page No.10 & 11)

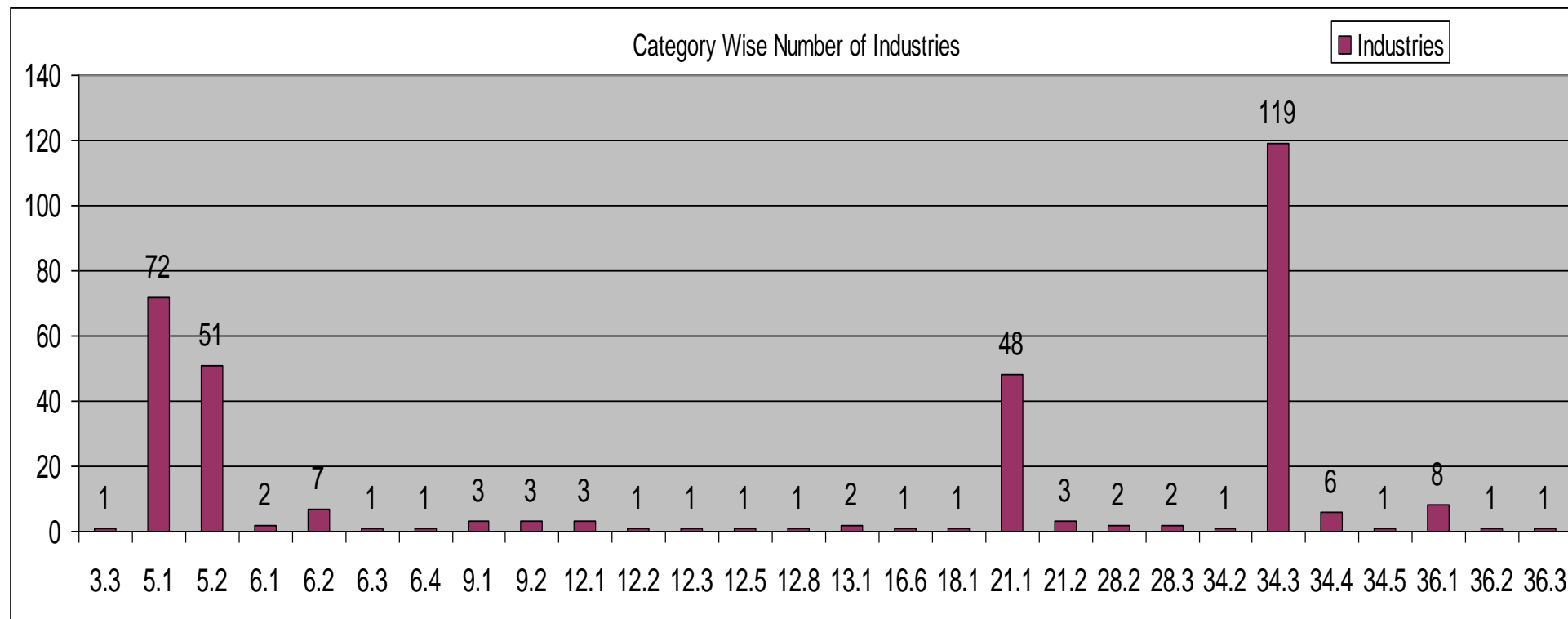
The details of Hazardous Waste Generating Units & category wise quantum of waste generated is placed at **Annexure-I**.

The list of units which have signed an agreement with M/s Ramky & M/s NGPL is placed at **Annexure-II**.

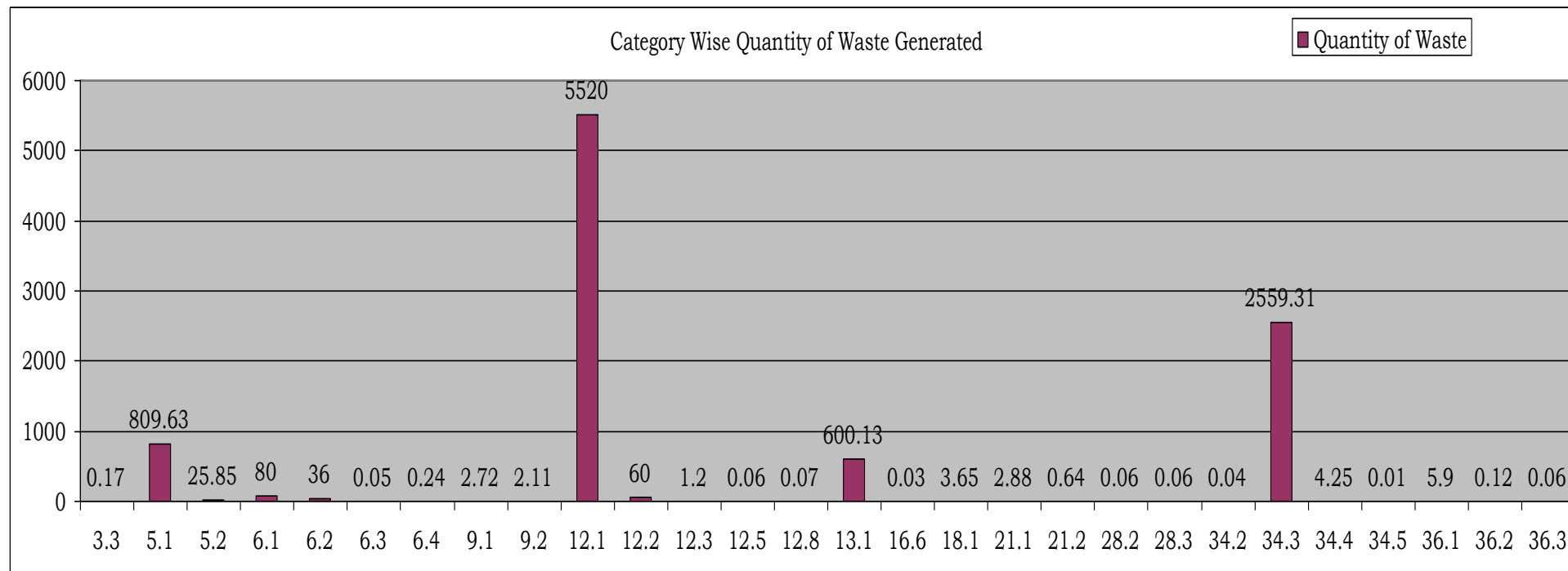
Categories of hazardous waste as per Hazardous waste (Management, Handling and Transboundary Movement) Rules-2008 are placed at **Annexure-III**.

List of transporters authorized under Hazardous Waste Rules for the collection and transportation of used/spent oil to CPCB registered recyclers is placed at **Annexure-IV**.

BAR GRAPH No.1



BAR GRAPH No.2



CHAPTER 4

HAZARDOUS WASTE MANAGEMENT

4.1 PRESENT WASTE MANAGEMENT PRACTICES

Based on the review of the information as provided by the industries in authorization forms/ consent forms and from the field visits, it is observed that till some time ago no organised waste disposal system existed and the hazardous wastes generated by the industries was being stored within their premises.

Chandigarh Administration has tied up with Govt. of Punjab so as to allow the disposal of hazardous waste generated in U.T. Chandigarh to be disposed of at Treatment, Storage & Disposal Facility (TSDF) at Village-Nimbua, Derabassi (Punjab) in the year 2008-09. The units have now started disposal in the aforesaid facility.

4.1.1 Handling and Storage

The hazardous wastes in almost all the industries are being handled manually. These wastes were being generally stored temporarily in drums, pits which is covered from top within the premises.

4.1.2 Transportation

Now after the tie up the landfillable hazardous waste is being transported to TSDF at Derabassi and M/s Ramky Enviro Engineers Ltd., (Operator of TSDF) has been granted authorization for the transportation of the hazardous waste from various units in U.T. Chandigarh to the disposal site. Further in case of used/spent oil four number units have been authorized (Annexure-IV) to collect, transport and dispose of the used/spent oil to the units registered with Central Pollution Control Board as authorized recyclers for recycling in scientific manner following the guidelines of hazardous waste disposal.

4.1.3 Recycle/ Reuse/ Recovery (The 3R Approach)

The following steps are being taken to implement the 3R approach.

- The used/spent oil & waste oil generated in industries & service stations is being disposed of to CPCB authorized recyclers only.
- The spent pickling acid generated in units undertaking pickling operations was earlier being treated in ETP's installed by the units. Now these units are being asked to dispose of this effluent to ferrous sulphate manufacturing units, which use this effluent as a raw material. This has led to reduction in generation of hazardous waste in the form of ETP sludge.

4.1.4 Treatment

No treatment is being given to the hazardous wastes generated by the units and is sent to TSDF for storage & treatment.

4.1.5 Disposal

Earlier there was no organized Waste Management Facility available in U.T. Chandigarh, therefore all the industries were storing the waste within premises, now after the tie up with TSDF (for the disposal of landfillable hazardous waste) and with CPCB authorized recyclers for used/spent oil, the hazardous waste is being scientifically disposed of.

CHAPTER 5

WASTE MANAGEMENT STRATEGY

5.1 WASTE MANAGEMENT OPTIONS

The strategy for the management of hazardous waste is proposed in accordance with the provisions of Hazardous wastes (Management, Handling & Transboundary Movement) Rules 2008. **Figure 5.1** (on next page) shows the approach followed to identify the waste management option for various type of hazardous waste getting generated in U.T. Chandigarh.

Depending on the characteristic of wastes first option is given to recycle, reuse or recovery of material that can be carried both on-site or off-site. If it is not possible to recycle/ reuse/ recovery of material, preference is given to dumping the waste in secured landfills facilities. Depending on the characteristic of waste, it may need a physical or **Characterization** chemical treatment before dumping into secured landfill facility. For the waste, which can neither, be recycled/ reused/ recovered nor can be sent to secure landfill facility should go for incineration. The incineration ash should than be sent to secured landfill facility.

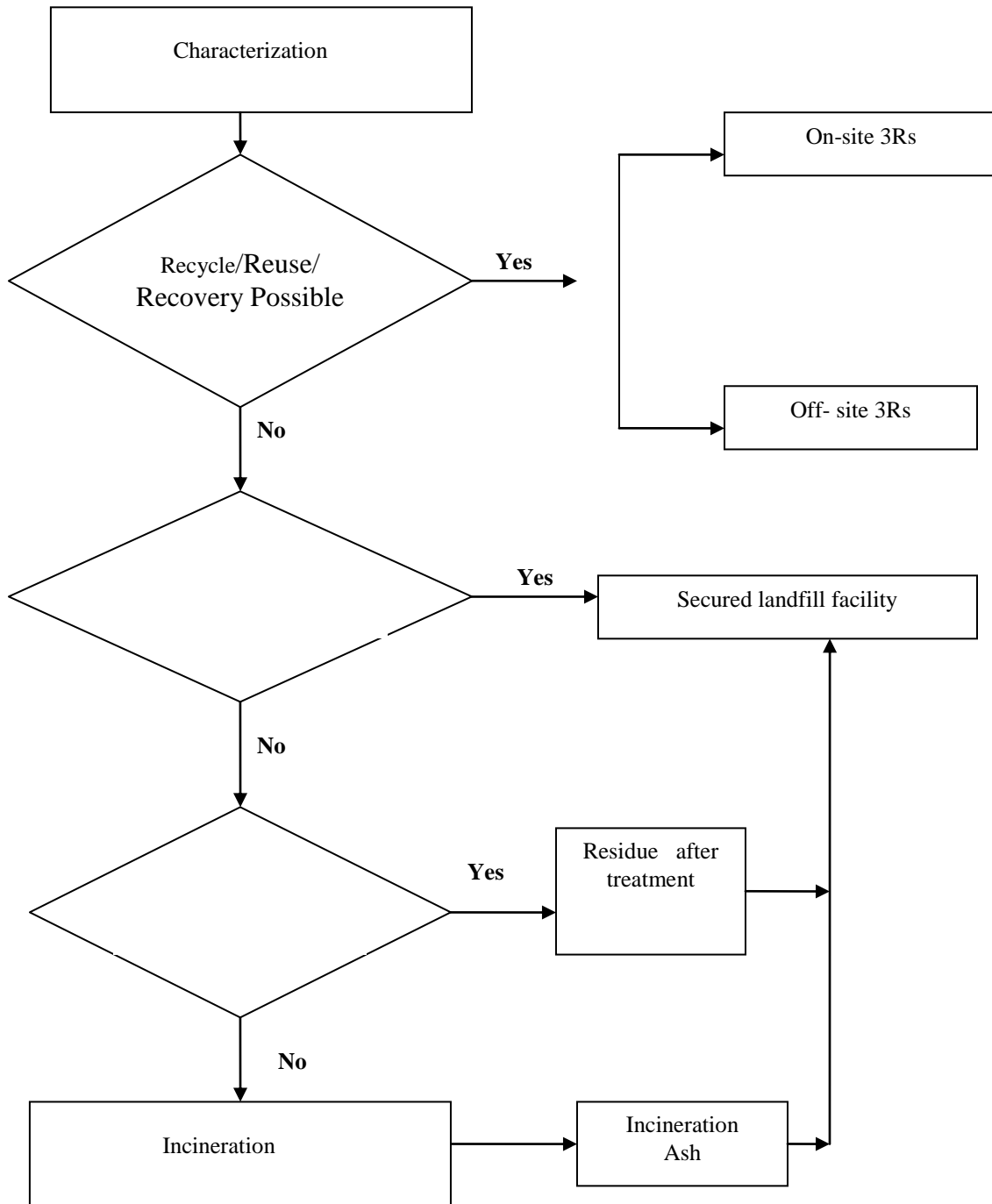


Figure 5.1 : Approach to identify the waste management options

The Proposed Hazardous waste Management strategies include:

❖ **Proper collection & handling of hazardous wastes at unit level**

- Hazardous wastes to be handled using protective devices like gum-boots, gloves, mask, apron, safety glasses, etc.
- Sludge generated from physico-chemical treatment should be segregated and stored separately for final disposal

❖ **Temporary storage facility for hazardous waste at each Industrial Estate/area**

- Store HW in closed containers and in isolation
- Mark HW suitably before storing
- Safety precautions should be adhered to HW storage area - roof/covered &
- fenced during monsoon season/ equipment failure
- Store non compatible wastes separately
- Surface water drainage system
- Leachate collection sump, if required.

❖ **Transportation of hazardous wastes from the individual unit to Temporary Storage Facility and from Temporary Storage Facility to common "treatment, storage & disposal facility" (TSDF)**

- Transportation through registered contractor
- Training of drivers engaged in waste transportation
- Implementation of HW manifest system as per HW Rules
- TREM card system

❖ **Final Disposal at TSDF**

- Waste receiving facility,
- Laboratory facility for characterisation,
- Temporary storage facility,
- Pre-treatment unit (physico- chemical treatment), and
- Secured landfill facility

CHAPTER 6 **CONCLUSIONS& ACTION PLAN**

6.1 CONCLUSIONS:

As per amended Hazardous Waste (Management, Handling & Transboundary Movement) Rules-2008, there are **237 units** generating approx **9736.08 TPA** of Hazardous Waste in Chandigarh out of which **5793.67 TPA** is recyclable/reprocessed and the remaining 3942.43 **TPA** is landfillable & is to be disposed of into Treatment Storage & Disposal Facility (TSDF) at Derabassi (Punjab).

The units generating landfillable hazardous waste which is to be disposed of into the TSDF have been asked to sign an agreement with M/s Ramky Enviro Engineers Ltd., (Operator of the facility) and M/s Nimbuan Greenfield Punjab Ltd., (NGPL-Developer of the facility). A total of **57 no.** units have signed the agreement and have started disposing of their hazardous waste into TSDF at Derabassi thus adhering to the maximum storage of deadline 90 days as per Hazardous Waste Rules-2008. Letters were sent to the rest of the units to sign up an agreement with M/s Ramkey & M/s NGPL which is being regularly monitored.

The units generating recyclable/re-useable hazardous waste are being directed to dispose of the waste to authorized recyclers through CPCC authorized transporters specifically authorized under the Hazardous Waste Rules-2008. The mechanism shall be strengthening in future by following various guidelines of the Hazardous Waste Rules and as per proposed action plan.

6.2 ACTION PLAN FOR HAZARDOUS WASTE MANAGEMENT IN U.T. CHANDIGARH.

The action plan for the proposed hazardous waste management plan in U.T. Chandigarh is as follows:-.

1. Prevailing practice of reprocessing or recovering used/spent/waste oil, using environmentally sound manner locally as per Hazardous Waste Rules, 2008 would be encouraged further.

2. The units which have not signed up an agreement for the disposal of hazardous waste into TSDF and have stored waste within premises/units shall be directed to do the needful immediately.
3. The oil soaked hazardous waste needs to be incinerated. It may not be economically and environmentally feasible to install a separate incineration for such a small quantity. Therefore, this Incinerable waste such as oil filters, oil soaked cloth and PUF residue may be managed along with used oil in environmentally sound manner.
4. There are various units undertaking pickling operation. Recycling/reuse of this waste may be encouraged.
5. Presently the incinerable waste is being stored in the units premises. It would be a target to identify a unit which will collect transport and dispose of such wastes for incineration.
6. E-waste is an addition to the list of category of hazardous waste. Units generating e-waste shall be identified and accordingly the hazardous waste generated shall be updated. It would be a target to find a solution for the proper disposal of such waste as per CPCB Guidelines.
7. A waste minimization circle shall be formed so as to encourage the industries to adhere to principle of waste minimization rather than end of pipe treatment/disposal.