1.0 INTRODUCTION

The Andhra Pradesh Pollution Control Board (APPCB) prior to bifurcation in the year 2013, in its continued efforts to ensure control of pollution arising from various industries located in Telangana Region, decided to procure consultancy services for Inventorisation and characterization of hazardous waste generated from industries in the State and to draw appropriate interventions to ensure its proper collection, storage, transportation and safe disposal. Project Implementation Unit of the World Bank funded “Capacity Building for Industrial Pollution Management Project” (CBIPMP) administered through then Andhra Pradesh Pollution Control Board and the Ministry of Environment & Forests, Government of India, engaged the joint venture of the Centre for Environment and Development, Thiruvananthapuram, M/s. GreenOrigin Ventures Pvt. Ltd., Hyderabad and M/s. Lahmeyer GKW Consult GmbH (Lahmeyer), referred as the ‘CED-GreenOrigin’ for accomplishment of the project by availing grants from the World Bank.

1.1 Background

Hazardous waste is any waste, which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances.

The Ministry of Environment and Forests, Government of India, notified the Hazardous Waste (Management and Handling) Rules on July 28, 1989 under the provisions of the Environment (Protection) Act, 1986, which were further amended in the year 2000 and 2003. Subsequently, these were repealed and the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 are notified for effective management of hazardous waste (HW), covering solids, semi-solids and other industrial wastes, and to enable the Authorities to implement pollution control measures related to storage, transportation, treatment and disposal of waste.

Hazardous waste has been defined as “any waste, which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances”, and shall include:

⇒ Wastes listed in Column 3 of Schedule-1;
⇒ Wastes having constituents listed in Schedule-2, if their concentration is equal to or more than the limit indicated in the said schedule; and
⇒ Wastes listed in List ‘A’, and ‘B’ of Schedule-3 (Part-A) applicable only in case(s) of import and export of hazardous wastes in accordance with the Rules 12, 13 and 14 if they possess any of the hazardous characteristics listed in Part-B of Schedule-3.

Please refer Appendix I for Schedule I and Schedule II categories of Wastes.

The Inventorisation exercise will bring out more detailed information in terms of total quantum of waste generated vis-a-vis its characteristics in terms of recyclable/reusable, land-disposable and incinerable components to form the basis for planning/augmenting treatment, storage and disposal facilities (TSDFs) and to verify the adequacy of existing TSDFs. Such common facilities need to be planned based on reliable estimates of the current waste generation and projections for the future.

Reasonably reliable estimates based on process and product-wise generation of waste will facilitate planning the type of on-site and off-site storage/treatment to be provided before disposal of waste in an environment friendly manner, depending on the characteristics and quantity of waste generation.

With this backdrop, then Andhra Pradesh Pollution Control Board took-up the task to inventories the hazardous waste in Andhra Pradesh (pre-bifurcated), under the World Bank funded CBIPMP project.

**1.2 The Project**

CED-GreenOrigin reviewed available data/information provided by then APPCB and other concerned Departments. CED-GreenOrigin’s Team conducted a detailed questionnaire survey and paid study visits to 31 identified industries in AP and TS to capture specific details concerned to industry sectors.

Scope of services of Inventorisation of hazardous waste (HW) project involves review of existing information, generation of add-on data from the industries for specific period of concern, establishing balances, identification of incompatible data/industries for suggesting action plans and to draw inferences for infrastructure development synchronizing with the needs. In this study, keeping in view of state bifurcation, only 10 districts data has been processed in respect of district-wise and sector-wise to draw inferences. While the entire industry data has been availed from multiple sources i.e. questionnaire survey, field visits, APPCB XGN data and others, the waste generation factors have been processed for the latest up-dated
data following a hierarchy of sources, by applying analysis of variation and statistics. Besides, following established logic diagrams, entire data has been evaluated for drawing region-specific inferences and way forward.

In addition, the entire industry data has been brought onto spatial platform for processing and visualization of data to facilitate in decision-making.

1.3 Organization of the Report

This draft final report is organized into 10 Chapters. Coverage in each Chapter is precisely discussed below:

Chapter-I : Introduction – Precise background on regulatory expectations in HWI and highlights the premise for Inventorisation and organization of the Report.

Chapter-II : About the Project - This Chapter covers study area, objectives, scope, approach for accomplishment of Inventorisation and characterization of HW categories in AP and Telangana regional hazardous waste Inventorisation. Approach covers questionnaire survey, data review and analysis, in-depth studies to cross check provided data by the units to establish waste generation factors, spatial data base generation, and drawing inferences and way-forward. Besides, schedule of project Reports submission and special conditions are discussed.

Chapter III : Data Collection and Questionnaire Survey - This Chapter explored potential sources of secondary information on industries, in order to identify list of industries, which are likely to be relevant to hazardous waste generation. It also describes contents of specifically designed questionnaire attached with industry-category-specific hazardous waste streams to guide industries in reporting all required types and categories of HW.

Chapter IV : Industrial study visits - This Chapter describes specific eight categories identified by APPCB for in-depth studies, industries studied by professional Teams and sectoral summary observations.

Chapter V : Data Compilation, Verification and Analysis – This Chapter covers hierarchy of relevant data sources
considered, units conversion factors, data verification procedures and recommended action programme. In addition, Andhra Pradesh (after bifurcation), Telangana State specific summaries are discussed besides findings of sectoral analysis.

Chapter VI: Spatial Data Base Generation, Processing and Analysis
– This Chapter covers approach followed in locating the industries on map, attaching industry-specific data to each industry specific point/node and spatial processing of the data for visualization and decision making.

Chapter VII: Summary Observations, Inferences and Way forward
– This Chapter summarizes observations on entire study and discusses way forward for effective waste management.

Chapter VIII: Disclaimer - This chapter specifies boundaries of use of this Report i.e. exclusively for use of the Client only and no liability on CED-GreenOrigin in case of unauthorized use of the data without prior consent of the CED-GreenOrigin, as the data input is from various sources, including interviews and discussions.

As such, material balance data of the industries is ascertained through the study visits, which are referred as highly confidential by the industries, and are shared with strict confidence on CBIPMP, which is solely responsible for any disclosure of the information or unauthorized access to the data.

1.4 Specific Note

1. Hazardous waste generation during April 2012 to March 2013 is the assigned task in February 2013.

2. Andhra Pradesh State till June 2, 2014 has 23 districts. In the context of Andhra Pradesh Re-organization Act, 2014, Andhra Pradesh (23 Districts) is reorganized into Telangana State (10 Districts) and Andhra Pradesh State (13 Districts).

3. This Report covers only 10 districts of Telangana State data for processing and drawing inferences.
2.0 ABOUT THE PROJECT

2.1 Study Area

Andhra Pradesh (pre-bifurcated) was formed on November 1, 1956 under the States’ re-organization scheme. It is the fifth largest State with an area of 2,76,754 sq. km, accounting for 8.4 % of India’s territory. The State has the longest coastline (972 km) among all the States in India.

It has 23 districts, which can be broadly grouped into Telangana, Rayalaseema and Coastal Andhra. Districts covered in these three regions are as follows:

- Coastal Andhra comprises of 9 districts i.e. East Godavari, West Godavari, Krishna, Guntur, Prakasam, Nellore, Srikakulam, Vizianagaram, and Visakhapatnam.
- Telangana comprises of 10 districts i.e. Hyderabad, Adilabad, Khammam, Karimnagar, Mehboobnagar, Medak, Nalgonda, Nizamabad, Rangareddy, and Warangal.
- Rayalaseema comprises of 4 districts i.e. Kurnool, Chittoor, YSR and Anantapur.

Andhra Pradesh Reorganization Act, 2014 for bifurcation of Andhra Pradesh received the President’s assent on 01 March 2014. This Act separated Telangana (10 districts) as a separate state and coastal Andhra and Rayalaseema will continue to be the Andhra Pradesh, w.e.f June 2, 2014.

Accordingly, District-wise details of Telangana are summarized in Table 2-1.

Table 2-1: District-Specific Area and Population in Telangana State

<table>
<thead>
<tr>
<th>S. No.</th>
<th>District</th>
<th>Population (2011)</th>
<th>Area, km²</th>
<th>Density, (/km²)</th>
<th>Official website</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adilabad</td>
<td>2,737,738</td>
<td>16,105</td>
<td>170</td>
<td><a href="http://adilabad.nic.in">http://adilabad.nic.in</a></td>
</tr>
<tr>
<td>2</td>
<td>Hyderabad</td>
<td>4,010,238</td>
<td>217</td>
<td>18,480</td>
<td><a href="http://hyderabad.nic.in">http://hyderabad.nic.in</a></td>
</tr>
<tr>
<td>3</td>
<td>Karimnagar</td>
<td>3,811,738</td>
<td>11,823</td>
<td>322</td>
<td><a href="http://karimnagar.nic.in">http://karimnagar.nic.in</a></td>
</tr>
</tbody>
</table>
2.2 Objectives

The major objectives envisaged by the Board under the consultancy assignment “Inventorisation and characterisation of the hazardous waste generation in Andhra Pradesh and Telangana States”, are:

⇒ To inventories hazardous waste generation in Andhra Pradesh and Telangana States, in pursuit of the provisions of the Hazardous Waste Rules, 2008 and subsequent amendments thereof.

⇒ To create a detailed geo-referenced database of the HW generating industries on the territory of Andhra Pradesh and Telangana States

⇒ To draw inferences and suggest way-forward for effective management of HW based on findings of the inventory

2.3 Coverage of Activities

Entire project scope is categorized into five tasks, which are as follows:

Task-I: Data collection and questionnaire survey (Dry Inventory - secondary information)
Task-II: Data review and analysis
Task-III: In-depth studies and determination of waste generation factors (Field Visits – in-depth studies comprising physical observations including collection of few samples for analysis)
Task-IV: Spatial data base generation, processing and analysis; and
Task-V: Inferences and way forward
Current Report presents entire scope of work.

2.4 Approach

Approach adopted for Inventorisation of hazardous waste generation is discussed in this Section. Flow and inter-relationship of activities are schematically represented in Figure 2-1. Specific steps in the approach are precisely discussed in Sub-sections.

2.4.1 Dry data collection through questionnaire survey

A comprehensive questionnaire (generic + sector-specific considerations) has been sent to all the identified hazardous waste generating industries based on preliminary information as available from the APPCB.

2.4.2 Data review and analysis

In accordance to the Hazardous Waste (Management and Handling) Rules, HW generating industries are identified based on following:

a. Based on processes listed in Schedule I: Each industry data has been assessed for process-wise generation of waste streams to decide whether process/waste streams fall under the purview of Schedule I of the Hazardous Waste (Management and Handling) Rules. If yes, the waste will be identified as hazardous waste.

b. Based on analysis reports: In case, the processes/waste stream of particular industry are not found in the list of Schedule I of the Rules, possible hazardous constituents have been reviewed for listed parameters in Schedule-II of the Rules, that are likely to be present in the wastes based on raw material used, process adopted, reaction(s) and the unit operation(s) involved.

To determine, whether a waste stream is hazardous or not, the characteristics of waste generated from processes are reviewed for relevant parameters as per list of Schedule-II of the Rules. If concentration of particular constituent exceeds the limit given in Schedule-II, the waste is categorized as hazardous. In specific cases, to crosscheck given data of the industries, 113 samples were collected and analyzed for concerned parameters, as per CPCB’s manual on sampling, analysis and characterization of hazardous waste (LATS/16/2002-2003).
Inventorisation and Characterisation of Hazardous Waste Categories in Andhra Pradesh and Telangana

Contract no: 1A1.1 of the World Bank funded CBIPMP, APPCB

October, 2014

Final Report Submitted by Centre for Environment & Development, GreenOrigin Ventures Pvt. Ltd. and Lahmeyer GKW Consult GmbH

1. Collection of list of industries from APPCB, Commissionerate of Industries etc. – List relevant to HW generation
2. Quantitative and qualitative compilation of hazardous waste data in prescribed formats
3. Designing generic questionnaire applicable for all industrial sectors: Part-A
4. Processing of inventory data for sectoral analysis
5. Designing sector-specific relevant hazardous waste questionnaire: Part-B
6. Identification of sector-specific HW streams and candidate industries for in-depth studies
7. Dispatching questionnaire (Part-A + Part-B) to all the identified industries
8. Collection of lat-long details of hazardous waste generating units – Creating nodes
9. Acquiring imageries, secondary sources of maps with required features
10. Development of basic land-use features – admin. boundaries, river basins, roads, drainage pattern etc.
11. Industry-specific and spatial data collection from various sources including APIIC - industrial estates, CETPs etc.
12. Compilation of lat-long details of hazardous waste generating units – Creating nodes

Figure 2-1: Approach for Inventorisation of Hazardous Waste Generation in Telangana States
2.4.3 In-depth studies to cross check provided data and to establish waste generation factors

In order to verify data provided by industries through questionnaire, CED-GreenOrigin Team visited selected industries in identified sectors in association with the APPCB Officers to conduct in-depth studies. The in-depth studies are aimed to crosscheck the data made available and to take some samples to verify the claims of industry & to establish waste generation factors. The coverage of aspects in estimation of waste generation factors is as follows:

i) Defining waste generation factor (WGF)

The waste generation factor depends on size of operation, waste management practices and process technology adopted. The CED-GreenOrigin identified industries in consultation with APPCB for in-depth studies; however, industries are selected considering quantity of production and process technology. Waste generation per tonne of product manufactured is referred as waste generation factor (WGF) and is defined as

\[ \text{WGF} = \frac{\text{Quantity of waste generated in a year}}{\text{Quantity of product produced in the same year}} \]

Effluent treatment plants, incineration facilities are normally considered as common facilities within the industry. Therefore, in case of multiple products, waste generation factor for ETP sludge/ incineration ash will not be used for other industries.

ii) Sludge estimation

The CED-GreenOrigin explored quantification of hazardous waste by availing appropriate techniques.

iii) Actual weighing: For wastes like tarry wastes, heavy metal filtration residues and waste arising from organic chemicals manufacturing units and rolling mills or where the wastes could be collected in a drum or bag and subsequently weighed in a spring balance.

iv) Discussion with plant personnel: For off-specification products arising from the pesticides formulation, pharmaceutical units and other complex processes involving multiple products operation, the WGFs will be arrived in...
consultation with operators/middle level/top management personnel.

This estimated waste generation factor from the above methods is availed to cross check the information provided by industries in particular sector. This is also used for estimation of waste generation, where information is not available for the particular size of production in the selected sector. The information collected during questionnaire survey and in-depth studies is compiled and presented as per the specific formats. The data is attached to the geo-positioned location of industry for spatial processing and analysis.

2.4.4 Spatial database generation

Latest imageries based GIS maps have been procured / developed for specific features. Latitude and longitude of the hazardous waste generating units is marked. The data sets of each hazardous waste generating industry are up-linked to develop GIS maps for spatial analysis.

2.4.5 Inferences and way-forward

Inferences in respect of status of hazardous waste generation, spatial distribution of sources, sector-specific and new States-specific analysis of information are drawn for designing way forward, in concurrence with national hazardous waste management policy.

2.5 Study Period

The Project Contract was signed on February 11, 2013 by the Client and the CED-GreenOrigin.


The CED-GreenOrigin conducted questionnaire survey covering all identified hazardous waste generating industries with due information to the Regional Offices, Zonal Offices, HW Division and CBIPMP. Besides, identified industries have been studied by professional Teams and gratefully acknowledge the support extended by the Regional Officers, Zonal Officers and HW Division besides the Officers of the CBIPMP Team.

The Schedule of questionnaire survey and project Reports submission dates are as follows:
2.6 Special Terms and Conditions

This Report has been prepared by CED-GreenOrigin solely for the use and benefit of CBIPMP management unit in APPCB (pre-bifurcated). Any use of this Report or information herein by persons or entities other than APPCB (pre-bifurcated) without the express written consent of CED-GreenOrigin will be at the sole risk and liability of said person or entity, and CED-GreenOrigin will not be liable to Boards or such persons or entities for any damages resulting there from. It is understood that this document may not include all information pertaining to industry and the described districts.

CED-GreenOrigin terms and conditions applicable for this Report are provided in Appendix IX.
3.0
DATA COLLECTION AND QUESTIONNAIRE SURVEY

3.1 Sources of Secondary Information

To identify sources of information about industries and their relevance to hazardous waste generation, an attempt has been made to review functions of different organizations, which are involved in administering regulation of industrial activities, such as Pollution Control Board, Commissionerate of Industries, APIIC, Directorate of Factories etc. AP Government (pre-bifurcated) established a single window facility to the entrepreneurs, which facilitates in following clearances:

**For establishment:**

1. Permission from Gram Panchayat, Municipality, UDA, T & CP, Factories Department.
2. Acquisition, alienation, and allotment of land.
3. Power feasibility & power connection.
4. Supply of water and water connection.
5. APGST & CST Registrations.
6. Financial assistance from APIDC.
7. Pollution clearance.
8. Registration of firms.
9. Drug licenses.
10. NOC from Fire Services Department.
11. License for establishment of distillery.

**For operation:**

1. Factories license.
2. License for storage of petroleum/ diesel/ naphtha.
3. Boiler license.
4. Pollution clearance for operation.
5. Food grain license.

Please refer Figure 3-1 for typical sequence of activities perceived to be followed by a new entrepreneur in establishing a manufacturing facility in Andhra Pradesh (pre-bifurcated).
Figure 3-1: Typical Sequence of Activities by a New Entrepreneur

The sequence of steps suggests the availability of list of industries and their department-specific jurisdiction, in order to analyze the suitability for availing the same list for short-listing of potential additional hazardous waste generating industries, beyond the list of industries covered in HW Inventorisation in the year 2010.

Relevance of different Departments/ Institutions and the utility of their data are discussed in sub-Sections.

3.1.1 Andhra Pradesh (pre-bifurcated) Pollution Control Board

APPCB is involved in issuing water consent, air consent and authorization for hazardous waste storage, transportation and disposal. Therefore, list of industries maintained by APPCB is directly
relevant, having significant level of pollution. Therefore, the list of industries for which authorization has been issued is the list that is directly relevant to hazardous waste generation, as these are verified by regulatory officers before issuing Authorization.

The CED-GreenOrigin collected inventory of hazardous waste generating industries in the state conducted by APPCB in 2008 and 2010, thus the data of preceding years are captured.

During discussions with APPCB officers, it is felt that there could be some hazardous waste generating industries, which are not covered by the Board; therefore some rational analysis of the issue may facilitate their regional Officers to track additional possible industries, which could be brought under the purview of issuing authorization for handling hazardous waste. Therefore, the CED-GreenOrigin attempted to review the modus operandi followed by new entrepreneurs in the State while establishing their industries, in order to track appropriate source of list of industries for facilitating the Regional Officers.

3.1.2 Commissionerate of Industries

The Commissionerate of Industries, Andhra Pradesh (pre-bifurcated) has following principle mandates:

- To assist and guide for promotion and setting up of Industrial units
- Industrial approvals and clearances from various Departments / Agencies at a single point.
- To register Micro Enterprise/ Small Enterprise/Medium Enterprises
- Sanction of incentives to eligible industrial undertakings.
- Create a transparent and automatic system of allotment of scarce raw materials to industrial units
- Enable educated youth who are unemployed to set-up their own ventures by arranging for financial assistance under the Prime Minister’s Rozgar Yojana (PMRY) Scheme, and so on.

The CED-GreenOrigin interacted with the senior officers in the Department and realized following specific points:
1. New entrepreneurs first register with the district Industry centre (DIC), which acts as a single window facilitator for guiding the entrepreneur to establish the industry.

2. All large industries are registered with DIPP, Ministry of Commerce, therefore may or may not be registered with DIC and all remaining industries get registered with DIC.

3. All industries registered with DIC are classified into red, orange and green categories, as per APPCB list, and accordingly advised for taking clearances from respective Offices.

4. Those industries, which do not cover under the list of Red, Orange and Green, are exempted from applying for consents, and are deemed to be non-relevant to pollution or pollution control Board for the purpose of taking clearances.

5. Registration of industry and referring that number for subsequent clearances is considered as an imperative requirement; therefore, list available with Commissionerate of industries is the possible exhaustive list.

6. A point to be noted here is that all registered industries with DIC are not necessarily commenced their operations. The list also provides status of their commencement.

7. The data is made available to the CED-GreenOrigin by the Commissionerate of Industries.

8. An attempt has been made by the CED-GreenOrigin in identifying the line of activity based possible relevance of industry sector to hazardous waste. Besides, it is also considered that industries, which have given date of commencement of the project, are only considered with the understanding that only those units commenced their operation, hence relevant for generation of possible HW.

9. The list of industries, as arrived in point no. 8 is intended to be compared with the list of industries inventoried by APPCB in 2010, district-wise, for identifying the industries, which still can be covered, in principle. However, actual operation of the industry, coverage of products and relevance to the hazardous waste may be established by the respective Regional Office of APPCB, to extend the applicability of HW Rules, in the next phase of renewal of Water/Air Consents.
3.1.3 Andhra Pradesh (pre-bifurcated) Industrial Infrastructure Corporation (APIIC)

APIIC is a body entrusted with the objective of providing industrial infrastructure through development of industrial areas. The Corporation has so far developed more than 300 industrial parks spreading over an extent of about 1,21,655 acres (including allotted area). Besides, the Corporation is also developing sector-focused parks like apparel park/food processing parks/leather parks, Special Economic Zones in the state.

The CED-GreenOrigin approached APIIC with a request to provide the layouts of 300+ industrial estates established and promoted by APIIC with the list of allottees.

The detailed discussions with concerned Environment Team reveals following:

1. The initial list of allottees available with the APIIC do not match with the current list of operators, as the land would have been transferred for other applications after initial block-in period.

2. APIIC made an attempt earlier to have compilation of the industries in their industrial estates and those compilations did not match with the list available with APIIC and as such the repeated such inventories reveals different findings without any set pattern.

3. Therefore, it can be realized that APIIC can only give an authentic industrial estate land layout maps/plot details but not the operations being performed in various plots.

3.1.4 Factories Department

Factories Department is primarily involved in following:

- Advice and guidance for management of factories
- Approval of plans of new factories
- Welfare measures for the industrial workers

The definition of factory is of concern here, as it refers to atleast 10 workers and for identified industrial sectors only, as given under the Factories Act.
The CED-GreenOrigin approached the Department and held detailed discussions with Senior Officers regarding coverage of the Act and relevance of list available with them to hazardous waste generation.

The discussions revealed following:

- The Factories Department feels that the list available with the APPCB can only be relied, as the list with them is with the different objectives and by knowing the name, the line of activities and their relevance cannot be arrived.

- However, it is given to understand that department has about 40000+ industries list.

From discussions, the CED-GreenOrigin understands that list as given by the department is an authentic list of “factories”. Factories by definition need to have atleast 10 workers, therefore those industries having less than 10 workers gets exempted. Besides, the entire list may not be relevant to hazardous waste generation, due to various lines of activities. As such, it was given to understand that industries, which are involved in storage of chemicals in godowns, are getting exempted from the license requirement, and thus need to be captured, in general, than others, as all others are getting captured by the multiple departments including Directorate of Factories, and cannot escape under the normal circumstances.

### 3.1.5 Other departments

Other departments in respect of their functions and relevance to the hazardous waste generation information are discussed in Table 3-1.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Department</th>
<th>Major function</th>
<th>Relevance to Hazardous waste</th>
</tr>
</thead>
</table>
| 1     | Central Excise Department         | • Collection of Central Excise duty and Service Tax  
• Besides, other taxes like National Calamity Contingent Duty, different kinds of CESS, Additional duty of Excise are also collected for the exchequer  
• Facilitates Export by sealing containers and packages under physical supervision. | • Industries, which are producing taxable products – a source of information for assessing relevance of industrial activity to hazardous waste generation.  
• It may be noted that certain industries are exempted from paying tax up to certain sales value, but may have relevance to possible HW; hence, the list as it is cannot be completely relied on. |
| 2     | State                             | • Administration of Value                                                      | • Can facilitate in tracking the                                                                 |

Table 3-1: Department-Specific Functions and Relevance to Hazardous Waste Generation
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Department</th>
<th>Major function</th>
<th>Relevance to Hazardous waste</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Commercial Tax Department</td>
<td>Added Tax (VAT), Entertainment Tax and Profession Tax. • Assessments of goods movement and posts</td>
<td>movement of goods for limited no. of items, of which many might be from the entertainment and other domains.</td>
</tr>
</tbody>
</table>
| 3     | Industry associations       | • Promote large, medium and small-scale industries involved in almost all major manufacturing fields. | ▪ Industry association will keep list of all their members and there is a possibility of maintaining summary statistics including the hazardous waste generation etc.  
▪ The list available with them may only be their members and not necessarily the entire industries in the state. |
| 4     | Civil supplies              | engaged in promotion, improvement, development of counsel and finance production, purchase, storage, processing movement, transport distribution and sale of food grains, foodstuffs and any other essential commodities and to establish laboratories for the purpose of ensuring quality control | ▪ Involved in transportation & distribution of commodities like - kerosene, LPG & petrol etc.  
▪ It can provide list of depots, for seeking information regarding HW generation. |
| 5     | APIDC                       | • Project promotion - generation & implementation of project ideas.  
▪ Equity participation  
▪ Venture capital for IT, biotechnology & sunrise industries.  
▪ Long, medium and short term loans  
▪ Bill discounting  
▪ Rehabilitation of sick industrial units | ▪ Involved in promotion of industries having several overlapping functions with APIIIC. However, exhaustive list of reliable industries is not expected from the Department, as not all the industries approaching it for financial and other support. |
| 6     | AP DISCOMs                  | • Engage in transmission and supply of electric energy                          | ▪ The HT lines commercial information could be retrieved from the Department; however, this information does not give the line of activity details for the purpose of arriving at the relevance to hazardous waste generation. |
### S. No. | Department | Major function | Relevance to Hazardous waste
--- | --- | --- | ---
7 | Mines and Geology | • Receipt and processing of Applications for the grant of leases under Mineral Concession Rules  
• To monitor scientific exploitation of mineral wealth of the state.  
• To control illicit mining, quarrying and transportation of minerals.  
• Scanning and identification of Mineral Resources  
• Guidance and Dissemination of Mineral Information  
• Promotion of mineral-based industries.  
• To monitor production and dispatches of various minerals.  
• To monitor collection of royalty and seigniorage fee based on grades/quantity.  
• Imposition of penalties on illicit mining, transportation and storage. | ▪ As such there are HT lines for non-industrial purposes and difficult to segregate.  
▪ List of mineral-based industries could be retrieved from the Department for sending questionnaires. |
8 | Public complaints | Public complaints  
Legal cases  
Specific industries in non-attainment areas etc. | ▪ All those industries, which have some public complaints/ legal/ court cases will attract the regulatory Boards and are often specifically tracked for the periodic updates by SPCB. Therefore, their list included. |

### 3.1.6 Summary observations

Summary observations on source of information regarding hazardous waste generating industries are discussed below:

1. The list available with the APPCB is much more relevant as it is the list verified and authenticated by the Regional Offices after thorough review of the industrial process and upon inspection.
2. Directorate of Factories issues permission for those industries, which have 10 or more workers and falls in the list of operations identified under the Factories Act, only. Therefore, the list may provide industries, but all of them may or may not be relevant to hazardous waste, and as such, the list does not represent entire possible hazardous waste generating industries. Therefore, the list would be a sub-set of industries listed with Commissionerate of Industries.

3. Entire list of industries available with Commissionerate of Industries (pre-bifurcated) reveals that 1,00,195 (4520 large and medium scale industries; 95675 are small scale industries, and Small and micro enterprises together; Large, medium and small scale units are defined as more than rupees 10 crores, 5-10 crores and less than 5 crores investment on plant and machinery, respectively) industries are registered in Andhra Pradesh (pre-bifurcated), so far. Registration with Commissionerate of industries does not mean that these industries are in operation since then, but are just registered to pursue the projects for their establishment and operation. It means this is an indicative list of industries only and not necessarily the list of industries, which are in operation. As such the list also classified in respect of Large and medium scale industries, and small scale and small & micro enterprises. It may be worth to mention that industrial operations are classified into red, orange and green category. The red (64), orange (25) and green (55) categories cover 144 identified industry sectors and all others beyond this list are considered to be non-polluting and do not require to take CFE/CFO from the pollution control Board. Therefore, the relevance of the industries to pollution is limited to red, orange and green categories only emphasizing large and medium scale.

4. Therefore, in view of above specific observations, it has been felt appropriate to consider following in sequence:
   a. List of industries to which HW authorization has been issued in 2010 was considered as first list for issuing questionnaire (1874 industries in TS)
   b. List of new industries to which consent for operation issued during Jan-Dec, 2012 and not covered in point “a” was considered as second list for issuing questionnaire
   c. List of relevant industries as identified from the Commissionerate of industries (4214 in no. in both AP and TS) minus the above two lists was considered as third list for issuing questionnaire
d. Possible list of additional industries/ depots/ operations as per Section 5.1.5 and others including Directorate of Factories, was considered as the fourth and final list for issuing questionnaire.

3.2 Questionnaire Survey

3.2.1 Industry sector-specific hazardous waste streams

State Pollution Control Board review every month, applications for Water/Air Consent and/or authorization for hazardous waste. The SPCB’s Technical Committee either considering or rejecting such applications on case by case, based on merits and limitations. Authorization for storage and safe disposal of hazardous waste has been given by the Board to 3222 Industries in 2010 and in addition, few industries are getting added every year, besides renewal of existing authorizations.

The specific observations on the reporting patterns by different industry sectors have been made keeping in view of the provisions under HW Rules, 2008. This review by the CED-GreenOrigin identified the notified industry sector-specific HW streams as per Schedule I of the Rules; other applicable streams such as ETP, solvent recovery, used oil etc. from the Schedule I itself; and applicable streams from the Schedule II considerations. This analysis is intended to facilitate the industries to report all relevant streams from their plants instead of just sectoral streams excluding other relevant streams from Schedule I and Schedule II. Please refer Appendix-I for Schedule I and Schedule II Streams.

Please refer Table 3-2 for detailed list of relevant sector-specific hazardous waste streams.

Table 3-2: Industry Sector-Specific Relevant Hazardous Waste Streams

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Industry Sector</th>
<th>Schedule I Streams*</th>
<th>Earlier Reported Schedule II Streams**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Directly relevant to industry sector</td>
<td>Others</td>
</tr>
<tr>
<td>1.</td>
<td>Aluminium products</td>
<td>11.1, 11.2, 11.3, 11.4, 11.5</td>
<td>5.1, 34.3, 34.4</td>
</tr>
<tr>
<td>2.</td>
<td>Anhydrous ammonia</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>3.</td>
<td>Anodizing</td>
<td></td>
<td>5.1, 34.3</td>
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<tr>
<td>No.</td>
<td>Category</td>
<td>Hazardous Waste Categories</td>
<td>Characterisation</td>
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<td>-----</td>
<td>-----------------------------------</td>
<td>-------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>4.</td>
<td>Asbestos products</td>
<td>15.1, 15.2, 15.3</td>
<td>5.1</td>
</tr>
<tr>
<td>5.</td>
<td>Auto spare parts &amp; Servicing units</td>
<td></td>
<td>5.1, 33.3, 34.4</td>
</tr>
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<td>6.</td>
<td>Basic organic chemical</td>
<td>28.1</td>
<td>5.1, 33.3, 34.4</td>
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<tr>
<td>7.</td>
<td>Bio-diesel</td>
<td>4.1, 4.2, 4.3, 4.4, 4.5, 4.6</td>
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<td>8.</td>
<td>Blades</td>
<td></td>
<td>34.3</td>
</tr>
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<td>9.</td>
<td>Breweries</td>
<td></td>
<td>5.1, 33.3, 34.3, 34.4</td>
</tr>
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<td>10.</td>
<td>Cables</td>
<td>21.1, 21.2, 8.2</td>
<td>5.1, 34.4</td>
</tr>
<tr>
<td>11.</td>
<td>Carbon</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>12.</td>
<td>Cargo</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>13.</td>
<td>Cellulose</td>
<td></td>
<td>5.1, 33.3, 34.3, 34.4</td>
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<td>14.</td>
<td>Cement</td>
<td>4.1, 5.1</td>
<td>B6</td>
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<td>15.</td>
<td>Ceramics</td>
<td></td>
<td>5.1</td>
</tr>
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<td>16.</td>
<td>CETPs</td>
<td>30.2, 34.3, 34.4, 34.2</td>
<td>5.1</td>
</tr>
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<td>17.</td>
<td>Chemicals</td>
<td></td>
<td>5.1, 34.3</td>
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<td>18.</td>
<td>Chlor-alkali</td>
<td>16.1, 16.2, 16.3</td>
<td>5.1</td>
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<td>19.</td>
<td>Chromium/chrom Products</td>
<td></td>
<td>5.1, 34.1, 34.3</td>
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<td>20.</td>
<td>Clay</td>
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<td>5.1</td>
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<td>21.</td>
<td>Coffee</td>
<td></td>
<td>5.1</td>
</tr>
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<td>22.</td>
<td>Compressors</td>
<td></td>
<td>5.1, 34.3</td>
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<tr>
<td>23.</td>
<td>Computer stationary</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>24.</td>
<td>Copper products</td>
<td>8.2</td>
<td>5.1, 33.3, 34.4</td>
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<tr>
<td>25.</td>
<td>Coke &amp; power</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>26.</td>
<td>Coal (dry)/mineral Processing</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>27.</td>
<td>Coal Washery</td>
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<td>5.1</td>
</tr>
<tr>
<td>28.</td>
<td>Construction</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>29.</td>
<td>Container cleaning</td>
<td>33.3</td>
<td>5.1</td>
</tr>
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<td>30.</td>
<td>Cosmetics</td>
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<td>5.1</td>
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<td>31.</td>
<td>Cotton wool</td>
<td></td>
<td>5.1, 33.3</td>
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<td>32.</td>
<td>Crushers</td>
<td></td>
<td>5.1</td>
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<tr>
<td>33.</td>
<td>Dairy</td>
<td></td>
<td>5.1, 34.3, 34.4</td>
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<tr>
<td>34.</td>
<td>Diamond jewelry</td>
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<td>5.1</td>
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<td>35.</td>
<td>Distilleries</td>
<td>36.4</td>
<td>5.1, 34.3, 34.4, 33.3</td>
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<td>36.</td>
<td>Dredging</td>
<td></td>
<td>5.1</td>
</tr>
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<td>37.</td>
<td>Drill bits</td>
<td></td>
<td>5.1</td>
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<tr>
<td></td>
<td>Hazardous Waste Categories</td>
<td>Codes/Sections</td>
<td>Remarks</td>
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<td>---</td>
<td>--------------------------------------------------</td>
<td>----------------</td>
<td>---------</td>
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<tr>
<td>39.</td>
<td>Dye &amp; dye intermediates</td>
<td>26.1, 26.2</td>
<td>5.1, 33.3, 34.3</td>
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<td>40.</td>
<td>Evaporator panels</td>
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<td>5.1</td>
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<td>41.</td>
<td>Electrical Equipments</td>
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<td>5.1, 5.2, 33.3, 34.3, 34.4, 21.1, 20.2</td>
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<td>42.</td>
<td>Electronics</td>
<td>31.1, 31.2</td>
<td>5.1, 5.2, 21.1, 34.3, 36.1</td>
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<td>43.</td>
<td>Electroplating</td>
<td>12.1, 12.2, 12.8</td>
<td>5.1, 34.3, 34.4, 20.1, 20.2</td>
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<td>44.</td>
<td>Explosives</td>
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<td>5.1, 33.3, 34.3</td>
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<td>Fertilizers</td>
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<td>5.1, 33.3, 36.4</td>
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<td>46.</td>
<td>Fermentation</td>
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<td>5.1, 33.3, 34.4, 34.3, 36.2</td>
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<td>Ferro industries</td>
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<td>48.</td>
<td>Food &amp; confectionery</td>
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<td>49.</td>
<td>Galvanizing</td>
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<td>5.1, 34.3, 34.4, 33.3</td>
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<td>50.</td>
<td>Glass, fiberglass Production and processing</td>
<td>23.1</td>
<td>5.1, 34.3</td>
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<td>51.</td>
<td>Glue and gelatin</td>
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<td>52.</td>
<td>Heavy engineering</td>
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<td>53.</td>
<td>Heavy water plants</td>
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<td>54.</td>
<td>Hot mix plants</td>
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<td>5.1</td>
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<td>55.</td>
<td>Incineration plants</td>
<td>36.1, 36.2</td>
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<td>56.</td>
<td>Industrial and Inorganic gases</td>
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<td>57.</td>
<td>Ink &amp; ink printing</td>
<td>21.1, 21.2</td>
<td>5.1, 33.3, 34.3, 34.4</td>
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<td>58.</td>
<td>Inorganic chemical</td>
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<td>59.</td>
<td>Integrated iron &amp; Steel</td>
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<td>5.1, 34.1</td>
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<td>60.</td>
<td>Isolated storages</td>
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<td>5.1, 5.2, 33.3, 34.3</td>
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<td>61.</td>
<td>Jute mills</td>
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<td>62.</td>
<td>Lab</td>
<td></td>
<td>5.1, 34.4</td>
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<td>63.</td>
<td>Lean and lead products</td>
<td>9.1, 9.2</td>
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<td>64.</td>
<td>Leather finishing</td>
<td>8.2, 30.1, 32.1, 32.3, 34.3</td>
<td>5.1, 33.3</td>
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<td>No.</td>
<td>Activity</td>
<td>Numbers</td>
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<td>Lime manufacturing</td>
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<td>66.</td>
<td>Liquor bottling</td>
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<td>67.</td>
<td>Lubricating oil, Greases or petroleum based products</td>
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<td>68.</td>
<td>Metal products</td>
<td>5.1, 34.4, 34.3</td>
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<td>69.</td>
<td>Mining/minerals</td>
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<td>70.</td>
<td>Nickel, cadmium &amp; Arsenic compounds</td>
<td>10.1</td>
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<td>71.</td>
<td>Oil &amp; gas exploration</td>
<td>2.1, 2.2, 2.3</td>
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<td>72.</td>
<td>Oil recycler</td>
<td>4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2</td>
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<td>73.</td>
<td>Oil refinery</td>
<td>4.1, 4.2, 4.3, 4.4, 4.5, 4.6</td>
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<td>74.</td>
<td>Paints</td>
<td>21.1, 21.2</td>
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<td>Pesticides</td>
<td>29.1, 29.2, 29.3</td>
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<td>Petrochemicals</td>
<td>5.1, 33.3, 34.3, 20.2, 20.3</td>
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<td>77.</td>
<td>Phosphate Processing</td>
<td>5.1, 33.3, 34.3</td>
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<td>Photovoltaic cells</td>
<td>5.1, 5.2</td>
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<td>79.</td>
<td>Plastic products</td>
<td>21.1, 21.2</td>
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<td>80.</td>
<td>Plywood</td>
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<td>81.</td>
<td>Pulp &amp; paper Industry</td>
<td>32.1, 32.2, 32.3</td>
<td></td>
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<td>82.</td>
<td>Resins</td>
<td>23.1</td>
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<td>83.</td>
<td>Rice mill</td>
<td>5.1, 33.3, 34.3</td>
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<td>84.</td>
<td>Secondary metal processing</td>
<td>6.1, 7.3, 8.2</td>
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<td>85.</td>
<td>Secondary non ferrous metals</td>
<td>3, 4, 5, 6, 9.1, 9.2</td>
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<td>86.</td>
<td>Solvent recovery &amp; Use</td>
<td>20.1, 20.2, 20.3, 35.1, 35.2, 35.3</td>
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<td>87.</td>
<td>Sponge iron</td>
<td>13.1, 13.2, 13.3, 13.4</td>
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<td>88.</td>
<td>Sugar</td>
<td>5.1, 34.3, 34.4</td>
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<td>No.</td>
<td>Category</td>
<td>Subcategories</td>
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<td>---------------</td>
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<td>89.</td>
<td>Surgical and medical Products</td>
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<td>90.</td>
<td>Steel products</td>
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<td>5.1, 33.3, 34.4</td>
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<td>91.</td>
<td>Synthetic detergent</td>
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<td>5.1</td>
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<tr>
<td>92.</td>
<td>And soap making</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93.</td>
<td>Synthetic rubber</td>
<td>23.1</td>
<td>5.1, 33.3, 34.4</td>
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<td>94.</td>
<td>Synthetic fibers</td>
<td></td>
<td>5.1</td>
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<td>95.</td>
<td>Tanneries</td>
<td>30.1, 30.2</td>
<td>5.1, 34.3</td>
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<td>96.</td>
<td>Textiles</td>
<td>24.1, 24.2</td>
<td>5.1, 33.3, 34.3</td>
</tr>
<tr>
<td>97.</td>
<td>Thermal power Plants</td>
<td></td>
<td>5.1, 34.2, 34.3</td>
</tr>
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<td>98.</td>
<td>Tobacco products</td>
<td>20.1, 20.2, 20.3, 29.2</td>
<td>5.1</td>
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<td>99.</td>
<td>And processing</td>
<td></td>
<td></td>
</tr>
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<td>100.</td>
<td>TSDFs</td>
<td>36.1, 36.2, 36.3, 36.4</td>
<td>5.1</td>
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<td>101.</td>
<td>Vegetable oils and Solvent extraction</td>
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<td>5.1</td>
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<td>102.</td>
<td>Wires</td>
<td></td>
<td>5.1, 34.3</td>
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<td>102.</td>
<td>Zinc processing</td>
<td>6.1, 6.2, 6.3, 6.4</td>
<td>5.1, 34.3</td>
</tr>
</tbody>
</table>

Note:
* List to be considered while reporting but not limited to only mentioned items
** List reported earlier by the industries, however, the respective numbers would vary as per the processes and corresponding waste characteristics

Above Table covers prevailing industries including red category for analyzing the profile of hazardous waste generation in Andhra Pradesh (pre-bifurcated), not an exhaustive list covering all categories. There are many more categories of industries, which generate only used/spent oil but are not known to be generating significant hazardous waste for the consideration under study. This is pertinent to mention that red, orange and green categorization of the industries is based on their pollution potential, which could be air pollution potential and/or water pollution potential and/or hazardous waste generation. Therefore, a specific industry having listed in it
does not necessarily mean generating hazardous waste. Therefore, the list of red, orange and green categories are considered to the extent to realize the relevance of the industry for the purpose of inventory.

3.2.2 Designing of questionnaire and phase-wise list of industries covered under survey

A comprehensive questionnaire has been designed and discussed at multiple levels of hierarchy of APPCB and after incorporation of the Banks observations, finalised for sending to the industries. Please refer Appendix II for a copy of the questionnaire. The specific points covered in the questionnaire are precisely given below:

Industry inventory reference no:
Industry Sector:

1. Name and address of industry
2. Contact person in the industry
3. Authorization for handling, treatment and disposal of hazardous waste:
4. Manufacturing capacities (TPA) and products manufactured within the premises
5. Details of products/intermediates out-sourced/procured for manufacturing
6. Raw material usage (TPA)
7. Manufacturing process with flow sheet showing material balance at various unit operations along with sources of waste generation
8. Product-wise hazardous waste streams, as per Schedule-I of HW Rules, 2008
9. Product-wise hazardous waste (HW) streams, as per Schedule-II of HW Rules, 2008
10. Generic waste streams
11. Hazardous waste stream-specific suitability for recycling, incineration and land-disposal
12. Description of storage, treatment and disposal of hazardous waste
13. Estimated quantity of hazardous waste stored on-site and off-site
14. Details of past accidents involving hazardous substances, if any.
15. Details of historical hazardous waste disposal area availed by the industry prior to TSDF’s establishment, if any

General Note:

Following a detailed approach covering multiple sources, as explained in preliminary study report, 2685 industries in T5 have been identified as relevant to hazardous waste generation, of concern.
Accordingly, questionnaires have been issued to the industries in following stages, with a copy to CEE, JCES, concerned Zonal Officers and Regional Officers of APPCB:

**Phase-I:** Questionnaires couriered to 1874 industries in between August 22 and September 12, 2013.

**Phase-II & III:** Questionnaires couriered to 754 industries in between December 5 and December 23, 2013.

**Phase-IV:** Questionnaires couriered to 57 industries in between December 25 and December 28, 2013.

This is a voluminous task - there were many constraints in reaching out to the industries because of inadequate address, pin code etc. The Team has acquired correct details through multiple efforts including contacting over phone, redirecting un-delivered mails etc. and accomplished this task. Schedule wise number of industries covered under questionnaire survey is given in Table 3-3.

### Table 3-3: Summary of Questionnaire Survey

<table>
<thead>
<tr>
<th>List</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
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<tr>
<td>First list</td>
<td>APPCB 2010 inventory list</td>
<td>1874</td>
</tr>
<tr>
<td>Second list</td>
<td>New industries to which consent for operation issued after Oct’ , 2010 till May, 2013</td>
<td>358</td>
</tr>
<tr>
<td>Third List</td>
<td>Relevant industries from the Commissionerate of industries - 4214 minus the industries in first and second lists</td>
<td>396</td>
</tr>
<tr>
<td>Fourth list</td>
<td>List of additional industries from multiple other sources</td>
<td>57</td>
</tr>
<tr>
<td>Total questionnaires sent</td>
<td></td>
<td>2685</td>
</tr>
</tbody>
</table>
Meanwhile, the project Team has requested for providing filled-in Form-IVs submitted by the industries for the period between April 2012 and March 2013. These form-IVs reveal actual waste disposal in that period and mode of disposal of the same by each authorized industry.

125 such Form-IVs available at either Head Office or extracted from XGN files are availed.

This is further to mention that then APPCB is maintaining a database of the industries with XGN Code No. to each of the industry. The CED-GreenOrigin Team has simultaneously collected the soft data that is available with the Board on line, for capturing the relevant data.

The Team is of the view that these multiple sources of data adequately facilitated in capturing hazardous waste generation in the state and to facilitate in fulfilling the Objectives.
4.0

INDUSTRIAL STUDY VISITS

In order to verify the data provided by the industries through questionnaire, the CED-GreenOrigin’s Team visited 31 industries in identified sectors. SPCB Officers from the Regional Offices joined the study Teams.

Industry sector-specific number of industries covered under in-depth studies, are given in Table 4-1. For the benefit of the Reader, all the 31 industries covered in both AP and TS are included in the Report.

Table 4-1: Industry Sector-Specific No. of Industries Visited for In-depth Studies

<table>
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List of industries covered under in-depth studies in each identified sector are given in next sub-Sections. Study visit Report of all 31 industries are placed at Appendix III.

4.1 Bulk-drug Industries

Andhra Pradesh (pre-bifurcated) is nesting a huge number of bulk-drug and pharmaceutical industries, manufacturing of wide variety of generic and specialty drugs. The synthetic batch operations involved in production of bulk-drugs is often complex in respect of implementation of environmental regulations.
The complexity can be attributed to following variations:

1. A specific bulk drug production may involve several process reactions and associated process operations.

2. Not all the process reactions are employed by all the industries i.e. some may procure intermediates and employ only remaining reactions. Therefore, the comparison of waste generation factors (WGFs) for a product is difficult to establish until unless all the process reactions and operations are same.

3. Scale of operation influences reaction conversion efficiency

Bulk-drug industry sector has largest no. of industries in the State. Therefore, maximum number of industries were proposed for study visits in this Sector, following a set rationale, as detailed in preliminary study report. The list of industries studied through field visits is as follows:

1. M/s. Aurobindo Pharma Ltd., Unit- V, IDA, Pashamaylaram, Patancheru (M), Medak District. (SRD-I)
3. M/s. Piramal Health Care Ltd (Unit-I), Digwal (V), Kohir (M), Medak Dist.
4. M/s Astrix Laboratories Ltd. (Formerly M/s Matrix Laboratories Ltd., Unit - II), Sy. No. 10 & 42, Gaddapotharam Village, Jinnaram Mandal, Medak District
5. M/s Virchow Chemicals (P) Ltd., Sy. No. 10, Gaddapotharam (V), Jinnaram (M), Medak District.
7. M/s. Divis Laboratories Ltd., Unit - II Chippada (V), Bimili (M), Visakhapatnam
8. M/s. Aurobindo Pharma Limited, IDA, Pydibheemavaram (V), Ranasthalam (M), Srikakulam District.
9. M/s Kekule Pharma Ltd., Sy. No. 180/1 to 15, Khazipally Village, Jinnaram (M), Medak District
10. M/s. SMS Pharmaceuticals Ltd., Industrial Estate, Sy.No.180, Khazipally (V), Jinnaram (M), Medak District.
11. M/s. Aurobindo Pharma Ltd., Unit-IX, Sy. No. 371, Gundlamachanoor (V), Hatnoor (M), Medak Dist
Specific observations are as follows:

1. Bulk drug industry involves batch processes and corresponding operations. Therefore, the waste quantity and quality varies w.r.t. each unit process and unit operation.

2. There is huge diversity in product mix, from one industry to other, which are largely driven by market demand. As the process specific variations of waste generations are significantly high, generalization of waste on qualitative and quantitative terms will vary, demanding at least product specific, if not unit process specific waste generation factors.

3. The no. of industries making a specific product are also limited due to patent issues, thus relative comparison of the manufacturing processes for many products are difficult to be ascertained. Therefore, a systematic approach that captures the variations adequately for drawing meaningful inferences is an essential requirement for dealing this industry sector, as it demands information, technical knowhow and plant practices.

4. The industry can be classified into three categories in respect of plant machinery, practices i.e. fully export oriented units, that are aspiring for FDA and other country quality certifications for exports, and third category comprises of industries, which generate drugs for indigenous markets. Export oriented units are in general having good machinery, automation, standard operating procedures, proper documentation, good housekeeping and reasonable safety measures. Whereas, the third category needs all round improvement in said features. The middle category are found good at some manufacturing blocks intended for exports and whereas others are inferior.

5. Emergency preparedness is found in first category of industries, whereas others still to attain the adequacy levels.

6. It was observed that many products involved in multiple unit processes, for getting the desired final product drug. Whereas, it has been observed that within a group company also, all the unit processes for a product are not necessarily manufactured in same premises. While the economics of the production are more or less same, the waste management costs are also influencing the decision of manufacturing location i.e. adjacent to coast, land-lock area, plants having membership in CETPs/TSDF etc.
7. It was observed that the consent for operation is given for maximum capacity of each product and cumulative production in a day. Whereas, it is observed that industries are producing higher capacity in respect of specific products beyond its permitted capacities, whereas the total production of all the drugs together are less than the total permitted capacity. This is of concern because, process-wise waste quantities would also differ, therefore, often the quantities that are sent to TSDF from a unit may not be consistent, due to variations in product mix.

8. There are specific industries, which are operating on deemed consent for prolonged periods, more than 3 years, often it is reported that renewal is pending at SPCB.

9. The Team observed that waste generation factors of the industries in study region w.r.t. WGFs published in CPCB documents are in general, less. However, there are cases where the waste generation factors are much higher than CPCB reference.

10. Some industries explored recycling of wastes to the extent possible, including for sodium sulphates, whereas the scope for such recovery is still to be explored by others. While it is largely driven by the economics of recovery, quality of recovered product and immediate market demand.

11. Waste handling practices require improvement across the industry sector in respect of identification of segregated streams, protocols for storage of incompatible (flammable, ignitable, reactive, corrosive) wastes, inadequate ventilation, lack of flame proof fittings, conspicuous identification of wastes, emergency response mechanism, workers health protection measures, etc.

12. To achieve zero discharge, the wastewaters are subjected to multiple effect evaporation followed by agitated thin film dryer, without checking the organic matter in it. Strippable pollutants at the operating temperatures are escaping into the atmosphere through stacks, as many industries are not recovering condensate for respective treatment..

13. Having forced evaporation systems in place, the biological wastewater treatment units are not operated to their designed efficiencies.

14. Used drums are water/steam-cleaned within the premises and sent to recyclers.
15. Odour problem is a common feature in and around effluent treatment plants, due to air stripping of volatiles.

16. Cost of the co-incineration is substantially lower than the common incineration facilities. Therefore, the industries are mixing spray drier wastes with spent carbon and organic residues on the premise of transportability up to the cement industries for co-incineration. Whereas, it is observed that continuous or higher frequency of monitoring of tail gas concentrations in cement plants are yet to be implemented to ensure adequate flue gas treatment norms, which is prerequisite for the cement plants accepting the kind of hazardous waste.

17. These organic residues, spent carbons and dried wastes are manually mixed by low skilled workers, whose health is a major concern, besides safety.

18. It is also observed that certain streams should not go to the co-incineration facility such as highly chlorinated organics etc. having the potential for reformation of the dioxins in the flue gas cleaning system. Whereas, no such quality monitoring system is in place either at cement plant or observing their suitability at the industry level.

19. It is also observed that the industries at times, sell the hazardous waste to middlemen, who in turn claim to send the wastes to the cement plants. The manifestation systems for selling the wastes including used oil/waste oil are not being practiced by many; as a result, wastes might not be reaching the destination, always.

4.2 Power Plants

Two industries i.e. one from the coal and other from biomass based thermal power plants were considered for study visits,

**Power plant (Coal based)**

1. M/s. My Home Industries captive power plant – 15 MW
2. M/s. My Home Industries Merchant power plant – 60 MW

This is to mention that instead of a single coal based power plant proposed in Preliminary study report, CED-GreenOrigin covered two coal based power plants one serving the captive requirement of a cement industry and other merchant power plant.

**Power Plant (biomass based):**
Typically, these plants are having an installed capacity of 6 MW power generations. Therefore, as proposed in preliminary study report, CED-GreenOrigin visited M/s. Satya Maharsi Power Corporation Ltd. Mutlayapalem, Amaravathi, Guntur District.

The specific observations are as follow:

1. The power plants do generate used oil/waste oil, which is mostly sent to boiler as a fuel, with in the premises. However, when the large quantities are available, the plants are selling to authorized recyclers.

2. Oil soaked cotton waste is found as another regular source of hazardous waste, sent to the boiler periodically.

3. Other waste includes ash from the boiler, which is non-hazardous in nature often utilized for brick making and other purposes.

4. Used drums are water/steam-cleaned within the premises and sent to recyclers.

5. Spent resins (water treatment) are required to be sent to TSDF, as practiced by the NTPC - Others are required to follow such practices.

Biomass based plants have poor housekeeping and hardly sending any waste to TSDF. Safety provisions are also required to be improved in these plants.

4.3 Cement Plants

CED-GreenOrigin studied two cement plants handling HW for co-incineration i.e.

Cement industry, which adopted co-incineration of HW (Liquid waste only):

1. M/s. My Home Industries Ltd., Mallacheruvu, Nalgonda – one of the largest cement producers in the State, which is co-incinerating liquid waste.

Cement industry, which adopted co-incineration of HW (Solid and Liquid waste):

2. M/s. Anjani Port Land Cement Ltd., Nalgonda – Reported to be the largest HW co-incinerating cement industry.
The specific observations are as follows:

1. Cement industries generate used oil and waste oils as hazardous waste, which are sent to kiln considering its high calorific value.
2. Selected cement industries are accepting liquid as well as solid wastes from the industries, for co-incineration.

Following are the specific observations on the co-incineration facilities:

i. Records showing receipt of hazardous waste and use in kilns are maintained.

ii. The HW received is in either solid or liquid form, as these units do not have arrangements to handle slurries.

**Liquid waste:**

iii. The liquid waste is tested for two parameters i.e. calorific value that should be more than 2500 Kcal/kg and the other one is viscosity i.e. should be pumpable.

iv. Liquid hazardous waste is received in tankers, which are unloaded into dedicated stainless steel storage tanks passing through filters.

v. From these storage tanks, the fuel is directly pumped to the kiln (central feeding) at pre-set rates, by availing dedicated pipeline system.

vi. These unloading and loading areas are often seen with spills, leaks, choking problems, safety issues etc.

vii. However, the Team is of the view that following systematic measures are required, as high calorific hazardous wastes as fuel are being handled:

1. Nitrogen blanketing to arrest fugitive emissions while unloading
2. Floating roof tanks
3. Proper dykes around storage tank
4. Water blanketing for storage tank to prevent domino effect in case of emergency
5. Metallic jumpers should be provided on all the pipeline flanges to give continuity to static charge till earthing to avoid sparks.

Please note that all the storage tanks, equipment, liquid
hazardous waste carrying tankers should be earthed properly on site.

6. Smoke detectors based water charging system
7. All the electrical fittings shall be flame proof
8. Overall, the entire system shall have fencing all around with security with properly demarcated no-smoking area. These facilities should be built at par with the furnace oil storage as per the standard operating procedures laid by the Chief Controller of Explosives.

Solid waste:

a. Hazardous waste is unloaded into sheds, which should have impervious surface with a dyke around.
b. Sodium & potassium together in final cement shall not exceed 0.6% and chlorides shall be less than 0.05%.
c. Sulphur, as such is not preferred, due to its negative effect in kiln, besides S02 problems
d. Corrosion and erosion of the plants is very high, due to use of hazardous waste as a fuel, a discouraging factor.
e. During the heavy rains, the hazardous waste, in particular, solid waste acceptance is avoided, due to lack of proper unloading/storage facility.
f. 25% of hazardous waste is mixed with coal, which is sent to hammer mill. From hammer mill, the combined mass is directed to ball mill to achieve a size to 90 microns (having 16-85 rejects above sieve size). At this stage, 250°C hot air is pumped to the mix, and the outlet gases are at 70°C, routed through chimney having 40m height. This particular activity is aimed at removing the moisture, whereas at this temperature, volatiles are stripped off from the combined feed, which is an environmental concern. This particular stream requires air pollution as well as regular monitoring for volatile organic compounds, say once in a shift.

4.4 Sponge Iron Plants

Sponge iron plants are spread in few districts i.e. Vijayanagaram, ananthapur, Kurnool, Chittoor, Nalgonda, Krishna, Khammam and Mehboobnagar. The Plant in L. Kota, Vizianagaram i.e GSAL (India) Ltd. now renamed as M/s. Steel Exchange Ltd., has been studied.

The specific observations are as follow:

Coal based direct reduced iron (DRI) plants do not handle any hazardous chemical (as stipulated in Manufacture, Import and Storage of Hazardous Chemical Rules). Whereas, the quality of ash from
waste heat boiler needs to be checked for applicability of hazardous waste regulations and for direct disposal of the waste in TSDF from the leachability point of view. As such, pyrometallurgical wastes are exempted from the purview of HW Rules, with a rider that CPCB guidelines need to be followed.

Spent oil and lubricants generated from moving equipment / machinery are collected in drums and given to authorized re-processor for recycling. The volume of spent oil and lubricant is about 300 l / year /100 TPD DRI.

**Occupational Health and Safety**

The occupational health envisaged in DRI plants are respiratory problems due to dust and carbon monoxide (CO) poisoning due to accidental exposure to untreated DRI gases. Workers working in areas like RMH yard and Product House that generates fugitive dust should wear nose masks / dust filters. In case a person inhales CO, he should be removed to fresh air and given mediated oxygen through a mask for 30 minutes and if required cardiopulmonary resuscitation should be performed. Thereafter, supportive treatment if required should be given in the nearest hospital. In order to cater to routine mechanical injury to body parts, first aid boxes equipped with medicines should be kept handy. The employees exposed to dusty environment should be subjected to regular health check-up. The workers should be diagnosed for respiratory functions at periodic intervals and during specific complaints for lung function test, sputum test, X-ray test, etc.

The direct reduction process is energy efficient, but is most competitive with the blast furnace when it can be integrated with electric arc furnaces to take advantage of the latent heat produced by the DRI product.

### 4.5 Metal Finishing Units (galvanising and electroplating)

A total of 5 industries (3 galvanising units and 2 electroplating units) have been studied. The list of the industries is as follows:

**Galvanising units:**

1. M/s. ECI Infra Towers Company Pvt. Ltd., Kaveli;
2. M/s. Reliance Galvanising Industries Plot no. 15 Rd. No. 2, Bhagyanagar Co-op Industrial estate, Balanagar, RR District;

**Electro-plating units:**
1. M/s. ECIL, IDA, Cherlapally, RR District; or
2. M/s. Hindustan Aeronautics Ltd., Balanagar, RR District

The specific observations are as follows:

**Galvanizing** is the process of coating steel with a layer of zinc that protects the steel from rusting. This process involves degreasing, pickling, fluxing, in which various acids and chemicals are used. Predominately hydrochloric acid, is used which is neutralized with lime and resulting sludge is disposed off to TSDF and the effluent is sent to CETP close to the plant location. Remaining hazardous wastes include Zinc ash and Zinc dross, which are disposed off to authorized recyclers.

**The Electroplating** process involves use of hazardous chemicals from pre-treatment (solvent degreasing, alkali cleaning and acid dipping), during plating, to the final buffing, grinding and polishing of the product. Electroplating uses metals including chromium, nickel, cadmium, zinc, copper, silver and gold etc., dissolvable salts including cyanide & sulphates, acids and alkaline solutions. In general, the sources of hazardous and solid wastes at a plating shop include:

- Spent plating baths
- Spent etchants and cleaners
- Strip and pickle baths
- Exhaust scrubber solutions
- Industrial wastewater treatment sludge, which can contain materials such as cadmium, copper, chromium, nickel, tin, and zinc
- Solvents used for degreasing

It was observed that sludge from various baths have quite substantial concentration of fluoride and cyanide besides being acidic.

We have also observed that there is about 5 tons of off spec chemicals and solvents in drums and carboys that are lying in the premises of ECIL, as reported, from last 5-7 years, awaiting disposal.

**Safety:** The process of acid dipping includes the use of hydrochloric, sulphuric and nitric acids, which are all corrosive to the skin and eyes. Acid mists may be evolved from high concentrations of acid, air or tank content agitation or elevated tank temperatures. Acid mists irritate the skin, eye, nose and throat, and may result in chest pain, cough and shortness of breath.
It is also observed that when the hot dip galvanizing operations are on, the Hydrofluoric acid fumes concentration is quite high in and around the pickling tanks and the workers have not been using respirators, goggles and hand gloves.

Hydrofluoric acid is highly toxic and corrosive through skin and eye contact. High levels of exposure may even cause organ failure and death. Calcium Gluconate Gel should be kept readily available for treatment of burns.

Training: Workers must be made aware of the need to carry out their work in such a way as to minimize their exposure, and the importance of proper use and care of all measures implemented to protect health and safety.

The training provided must be readily understandable by any person to whom it is provided.

In workplaces where cyanide is being used, stored or handled, workers should be trained to recognize the symptoms of cyanide poisoning and to apply relevant first aid procedures.

Maintenance: Plant used in environments where the atmosphere is acidic is at an increased risk of corrosion damage. Regular inspection and maintenance should be conducted, especially for lifting equipment such as cranes, hoists, chains and hooks.

4.6 Petroleum Refineries

It has been felt appropriate to cover 4 industries in this segment for in-depth studies. The composition includes existing two petroleum refineries, one edible oil extraction industry and one waste oil reprocessing facility, which are as follows:

Petroleum refineries:
1. M/s. HPCL Malkanuram Visakha Refinery, Visakhapatnam
2. M/s. ONGC, Mini refinery, Thatipaka, EG District.

Edible oil extraction unit:

Waste Oil reprocessing unit:
The specific observations are as follows:

**Oil Refineries**

The type and quantum of the pollutants generated in oil refinery will depend on type of crude and processes, which are in use. The major pollutants emanated are emissions of oxides of sulphur (SO\textsubscript{x}), volatile organic compounds (VOC), Oxides of nitrogen (NO\textsubscript{x}), particulate matters (PM), liquid effluent and solid wastes that include various sludges, oily waste and spent catalysts from various processes employed in refineries.

Crude oil is a major source of energy and feedstock for petrochemicals. Oily sludge, bio-sludge and chemical sludge are the major sludges generated from the processes and effluent treatment plants of the refineries engaged in crude oil refining operations. Various types of pollutants like phenols, heavy metals, etc. are present in the sludges and they are treated as hazardous waste. Oily sludge, which is generated in much higher amount compared to other sludges, contains phenol (90-100 mg/kg), nickel (17-25 mg/kg), chromium (27-80 mg/kg), zinc (7-80 mg/kg), manganese (19-24 mg/kg), cadmium (0.8-2 mg/kg), copper (32-120 mg/kg) and lead (0.001-0.12 mg/ kg). Uncontrolled disposal of sludges shall cause degradation of environmental and depreciation of aesthetic quality.

Tank bottom sludge containing about 80% of oil is subjected to recovery of oil by extraction and other mechanical systems to bring down the percentages to below 10%, which is disposed off to TSDF. Besides, spent catalysts are also disposed off to TSDF.

It is observed that good housekeeping in the entire plant including tank farm areas and timely maintenance of oil storage tanks is the key to achieve reduction in sludge quantity and involvement of less manpower.

Emergency preparedness re-training and drill practices establish required confidence and skills to handle the adverse situations with reduced losses. This area needs focused attention.

**Used/waste oil reprocessing:**

It is a hazardous waste processing facility, where industries are sending their used oil/waste oil for refining and recovery of fuel fraction. We understand that waste oil/ used oil recycling industry is
not receiving the adequate quantity of waste oil/used oil from the member industries, automobile service stations and workshops.

The waste generated from this recycling industry includes bleaching earth contaminated with oil, which is disposed off to cement industry for co-incineration.

During our visit, we observed that housekeeping in the plant needs to be improved, specifically in and around the area of filter press operation.

It was also observed that people needs to be re-trained to use the safety appliances effectively while working in the plant.

As the oil is inflammable and explosive, care must be taken to ensure electrical fittings are flameproof fittings even light fittings without any exception. Additionally, matching firefighting and emergency handling system including the trained personnel who are going to operate must be kept ready at all the time. This aspect needs improvement in oil recycling industry.

### 4.7 CETPs

AP is having three operating CETPs at Jeedimetla, Patancheru and Parawada. Therefore, all the three CETPs are covered for in-depth studies, as these are the potential source of hazardous waste generation i.e.

1. Jeedimetla Effluent Treatment Ltd., Plot no. 267 Phase-I, IDA, Jeedimetla, RR District.
3. CETP of M/s. Ramkey Pharmacity (I) Ltd., Pharmacity, Parawada

Specific observations on CETPs include following:

1. SPCB brought in many interventions to streamline the treatment, which includes acceptable quality criteria revision at many number of times to ensure gradual improvement and at the same time enhancing the treatment schemes with new cost-effective technologies to manage the quality variations in the effluents.

2. JETL is currently serving about 200 active member industries.

3. At JETL, wastewaters are broadly categorized into high TDS bearing and low TDS bearing effluents, inorder to meet 2100 mg/l standard of the treated effluents. Low TDS streams are treated
through extended aeration process, whereas high TDS streams are further concentrated in MEE and sent to spray drier.

4. At JETL, biological sludges and spray drier salts are sent to TSDF, periodically. ETPs sludges are having high annealing losses restricting direct land-disposal. As such, co-incineration can be explored, if the quality is consistently suitable.

5. CED-GreenOrigin has taken samples of sludge to check the constituents, which reveals that the sludge falls under hazardous category requiring stabilisation before land-disposal.

6. JETL made a pilot plant for recovery of waters from the biologically treated wastewaters. This reverse osmosis plant is found economically viable, considering the rejects handling in high TDS route, within the premises.

7. At PETL, set wastewater acceptance criteria and dilution with Vaagu waters are facilitating homogenization and compatible feed quality to the biological treatment system is made compatible. As such, major industries generating more than 25 KLD were asked to have zero discharge scheme, as a result, influent flows substantially reduced and now the plant is under loaded hydraulically.

8. PETL is currently serving 124 member industries. Like JETL, PETL cannot accept high TDS bearing effluents, as the MEE and spray drier mechanism is not available, which is largely attributed to the space constraint i.e. PETL is in only 5.6 acres.

9. Biological sludge from PETL is sent to TSDF, periodically. Whereas, the waste contains higher annealing losses hence suitable for incineration.

10. While PETL intends to recover freshwater out of treated wastewaters by installing reverse osmosis, the rejects management is not possible within the premises, hence discharges treated waters into 18 KM pipeline.

11. It is noted that sludge accumulation in equalization tanks is a regular phenomenon at PETL, thus are dried and lifted to TSDF at set intervals. However, their regular cleaning schedule could not be ascertained.

12. At CETP, Visakhapatnam, wastewaters are broadly categorized into high and Low TDS bearing effluents for respective treatment. Low TDS streams are treated through extended aeration process,
whereas high TDS streams are further concentrated in MEE and sent to spray drier.

13. Biological sludge and spray drier salts are sent to TSDF in Pharmacity itself for disposal, periodically.

14. CED-GreenOrigin’s Team collected number of grab samples at Visakhapatnam CETP to check the performance. Findings demand a detailed performance evaluation of each unit in the treatment system to ensure consistent performance.

General remarks on CETPs together include following:

15. An established protocol for sampling of influent wastewaters and performance of treatment is followed, including continuous monitoring instruments, which are under various stages of calibration/operation.

16. It is noted that settled sludge from equalization tanks are placed in open tanks for drying. Considering higher water content in such sludges, it is a requirement to avail either sludge drying beds or decanter/centrifuge for concentration.

17. CED-GreenOrigin’s Team also observed that directly sending sewage into equalization tanks through distribution chambers does not provide any opportunity for segregation of grit removal, which often settles in the equalization tanks despite having aeration system. Therefore, effective volume of equalization reduces with time, forcing frequent sludge removal; therefore, a regular mechanism to separate inert solids from sewage would further benefit the process.

18. Presence of metals in the industrial effluents is a known concern. It is also evident that not all the metals settle at given operating conditions, therefore, clari-floculator efficiency needs careful examination from the point of view of metals separation also not just limiting to colloidal solids removal. As the un-separated metals in the clari-floculator will make entry into biological treatment and end-up in secondary sludge challenging Schedule II conc. limits of HW Rules.

19. Frequent power supply cuts shall not be a premise for non-compliance to the prescribed limits. Here is a need to have back-up power facilities and regulatory authorities to check the power consumption of back-up power sources to ensure un-interrupted operations.
4.8 TSDFs

The CED-GreenOrigin Team studied both the TSDF facilities i.e.

1. M/s. Hyderabad Waste Management Project – HWMP, Dundigal, RR District
2. M/s. Coastal Waste Management Project – CWMP, Pharma City, Parawada, Visakhapatnam

Specific observation on TSDFs include following:

1. Standardized protocols are used for testing the quality of HW and accordingly deciding the mode of disposal.

2. Internal manifestation systems are being followed, however, block in which each type of waste is disposed within the landfill could not be tracked readily.

3. Stabilisation system is grossly inadequate - requires immediate action for collection of fugitive emissions through ducts and hoods and terminal control system such as carbon canisters to ensure safety and health of workers involved in operations.

4. Dundigal TSDF has reported that leachate from landfills is sent to common incinerator for use as a quench liquid. Leachate is having 445 mg/l of mercury, such a high conc. bearing effluents cannot be sent for quenching, as mercury gets air borne, and challenges adequacy of tail gas treatment system. Therefore, the practice shall be discontinued.

5. At Dundigal TSDF, leachate requires MEE followed by drier treatment. Condensate requires appropriate treatment and the sludge requires proper treatment/stabilisation before land-disposal. This system is required either within or out-side the premises, inorder to handle leachate from TSDF.

6. At Dundigal, monitoring bore wells bearing no.10 and no.11 are showing significantly higher TDS and Nitrates, which is a concern. Detailed investigations are required to identify the potential sources, inorder to restrict building of concentrations in soils and groundwaters. As such, receptor protection measures will have to be implemented, besides planning for remediation.
7. At Dundigal, prolonged storage of leachate bearing very high concentrations is not advisable and hence the tanks need to be emptied on priority. If the higher groundwater TDS concentrations in the surrounding monitoring wells are of any indication, there is a need to assign higher emphasis on containment of all the potential sources, of which leachate ponds occupies top priority.

8. Higher Nitrates in leachate of both TSDFs shows that stabilisation of the waste before disposal into the landfill requires strict vigilance and protocols for inspection.

9. At TSDF, Visakhapatnam, quality of leachate shall be monitored regularly for metals, in particular and Nitrates, and if required needs segregation for specific treatment instead of exploring dilution by connecting the stream to wastewater collection network of the Pharmacity.
5.0 DATA COMPILATION, VERIFICATION AND ANALYSIS

Sources of relevant data, reliability and short-listed industries in AP and Telangana generating hazardous waste have been clearly discussed in Chapter III. For all the identified industries, questionnaire has been issued for collection of detailed information, and pursued the matter through all the Regional and Zonal Offices.

Accordingly, a detailed presentation has been made to the Board chaired by the Chief Environmental Engineer appraising the approach, designed verifications and alternative sources of information that are explored to fulfill the data requirement for the project.

In accordance to the discussions, detailed data verification system, development of waste generation factors, extrapolation and drawing Andhra Region and Telangana Region wise summary statistics have been accomplished.

This Chapter discusses the data compilation, data verification and analysis procedures.

5.1 Hierarchy of Sources for Relevant Data

Inventorisation of hazardous waste is a difficult task for accomplishment, as the industry considers HW related data is confidential information. Besides, the information would be shared only to the Regulatory Boards but not to the consultants. There are many industries, which consider that the data can be of advantage to the competitors in finding the production patterns etc. Therefore, acquiring data in a straightforward questionnaire is often difficult and requires an approach, which explores and consolidates data from various sources simultaneously to fulfill the objectives. Accordingly, following sources of information have been considered for the Hazardous waste inventory of the Andhra Pradesh and Telangana States for the year April, 2012 – March, 2013:

- First source of data is considered as the industries, which were covered under study visits. During the studies, waste generation factors have been verified by the CED-GreenOrigin’s Team, therefore same are considered reliable for extrapolation, as applicable.
Project-specific data requirement is designed into a questionnaire and sought information from the industries. Therefore, the second reliable source of information is considered as industry filled-in questionnaire.

Third source of information is the industry filed Form-IV copies into APPCB data bank (XGN Code based data) authorized through APPCB nodal Officer. As the industries are to submit the Form-IVs at the end of the financial year, the quantities quoted in the Form IV are exact waste quantities disposed. Hence are actual, while specific stream-specific details may not be available through such data.

Major 12 industries authorisation quantities were considered as fourth reliable source, with checks.

Fifth source is the data reported by TSDFs (industry-specific data from TSDF is compared with XGN database), as is the quantity exactly disposed, considered reliable.

Sixth source is the APPCB data bank (XGN Code based data) giving details of licensed capacity of production and HW generation. This data is useful to apply waste generation factors developed for the product to arrive at likely corresponding estimated hazardous waste generation i.e recyclable, incinerable and land-fillable.

Last source is the data as filed by industries in the recent inventory conducted by the APPCB, after checks.

### 5.2 Data Compilation and Processing

Specific points concerned to data entry, and analysis include following:

- Entire data is compiled in one single format covering all 15 points of questionnaire. This file is called, master file.

- Ensuring conversions of units into single type for relative comparison and for summarization.

- Data cross checks – Waste generation w.r.t. developed WGFs, mode of disposal, waste quantity matching with TSDF/co-incineration plants.

- District-specific inventory details are segregated and summary statistics are discussed.
• Andhra and Telangana regional analysis of data and drawing summary statistics and inferences.

• Multiple industrial sectors, generating significant quantities of hazardous waste are identified from the master file. Accordingly, major industry-sector-specific data is separately processed to draw sectoral inferences.

• Multiple levels of verification: Project engineer, sr. project engineer, GM/expert associate’s review, Team Leader’s review

• General challenges: Addresses are not proper, time consuming, product-wise waste streams are not given, mixed wastes for few products, inadequate repetition of same products for arriving at WGFs particularly in case of batch processes, misplaced sectoral identification, no fixed units for weight / comparison etc.

• There are data gaps in respect of latitude and longitude, which made CED-GreenOrigin to explore number of sources to ascertain the location of the industries. Further discussed in Spatial Analysis Chapter.

5.3 Data Verification

Compiled data, after correcting the units, is subjected to following verifications:

a) Verification of HW generation reported by the industries with reference WGFs
b) Verification of appropriate mode of disposal of HW Category-wise
c) Verification of reported hazardous waste quantities sent to disposal facilities

Each of these verifications is discussed further below:

5.3.1 Verification of hazardous waste generation reported by the industries with reference WGFs

Verification of the reported waste generation is an essential check in the process of hazardous waste inventorisation. Often getting exact quantity of waste generation is not feasible, as many factors influence it i.e.:

1. Process Chemistry (Cleaner chemistry)
2. Cleaner production/Conversion efficiencies
3. Instrumentation and automation
4. Knowledge and skill sets of operators
5. Purity of raw materials
6. Thermodynamic limitations
7. Moisture content and influential meteorological conditions
8. Risk analysis, safety gadgets, emergency preparedness, number of near misses etc. reduces wastes
9. Recycling and reuse potential of wastes and surrounding market potential, which makes it economically attractive
10. Housekeeping, awareness
11. Regular training and capacity building of people
12. Recognition and encouragement of efforts made by the workers towards production and waste management objectives etc.

CED-GreenOrigin’s Team kept the influencing parameters in the backdrop, during in-depth studies, in identified industries. Best efforts have been made to identify the material balance of the various products, by accessing authentic database from the industry and field verification of the products, which are in production.

CED-GreenOrigin developed waste generation factors during in-depth studies, which are considered as the first reference waste generation factors. A compilation of these waste generation factors is given in Table 5-1.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Industry sector</th>
<th>No. of WGFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bulk drugs</td>
<td>Products: 157, Processes: 202</td>
</tr>
<tr>
<td>2</td>
<td>Power plants (coal based and bio-mass based)</td>
<td>Products: 6</td>
</tr>
<tr>
<td>3</td>
<td>Cement plants</td>
<td>Products: 4</td>
</tr>
<tr>
<td>4</td>
<td>Metal finishing units (galvanizing and electroplating)</td>
<td>Products: 9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>Products: 176, Processes: 202</td>
</tr>
</tbody>
</table>

Second reference considered are publications of CPCB, which covers four chemical industry sectors. No. of industry sector-specific WGFs published by CPCB are given in Table 5-2.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sector</th>
<th>No. of WGFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bulk-drugs &amp; pharmaceuticals</td>
<td>Products: 106, Processes: 295</td>
</tr>
<tr>
<td></td>
<td>Category</td>
<td>Products:</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>2</td>
<td>Pesticides</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Dyes &amp; dye intermediates</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Petro-chemical industries</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>154</strong></td>
</tr>
</tbody>
</table>

Third reference considered is the compiled available data, analysis of variation, statistical evaluation, determination of appropriate representative waste generation factor. For example, waste generation factor for used/waste oil from power plants is discussed below, as a model case reference.

Please refer, Figure 5-1 for waste generation factors reported by the power plants in Andhra Pradesh in 2010.

There are four industries, which reported abnormally high used/waste oil. These four industries are:

1. M/s. Seenaiah & Co. Ltd. Nellore
2. M/s. Priyadarshini Spinning mills Ltd. (Gas power Division), East Godavari
3. M/s. LVS Power Ltd., Pendurthy, Visakhapatnam
4. M/s. Sri Kalyani agro products & industries Ltd., Prathipadu, West Godavari

Once these four industries are removed from the entire list of power plants, variations could be seen in Figure 5-2.
Figure 5-2: Power plant-wise used/waste oil generation factor (excluding extremely high reported 4 industries)

Another plot comparing power plant capacity and WGFs is shown in Figure 5-3.

Figure 5-3: Power plant-wise used/waste oil generation factor (excluding extremely high reported 4 industries)

Figure 5-3, does not indicate any direct correlation. Please refer summary statistics in Table 5-3 and Table 5-4.

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Mode</th>
<th>STD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal based Power plants WGF, Kl/MU</td>
<td>0.00003</td>
<td>0.03358</td>
<td>0.01680</td>
<td>0.00269</td>
<td>0.00875</td>
<td>0.01751</td>
</tr>
<tr>
<td>Biomass based Power plants WGF, Kl/MU</td>
<td>0.00103</td>
<td>0.16583</td>
<td>0.03588</td>
<td>0.01794</td>
<td>0.06022</td>
<td>0.12044</td>
</tr>
</tbody>
</table>
Table 5-4: Summary Statistics

<table>
<thead>
<tr>
<th>Coal based power plants</th>
<th>Biomass based Power plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>Total No of Industries</td>
</tr>
<tr>
<td>27</td>
<td>No of industries with in STD</td>
</tr>
<tr>
<td>19</td>
<td>No of industries beyond STD</td>
</tr>
<tr>
<td>39</td>
<td>No of industries within Range</td>
</tr>
<tr>
<td>7</td>
<td>No of industries beyond range</td>
</tr>
</tbody>
</table>

Table 5-5: Waste Generation Factor

<table>
<thead>
<tr>
<th>Power</th>
<th>Biomass based Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean WGFs of industries with in STD</td>
<td>0.00272</td>
</tr>
<tr>
<td>Mode of industries with in STD</td>
<td>0.00269</td>
</tr>
</tbody>
</table>

Recommended waste generation factor is 0.00269 for coal-based power plants and 0.018 for biomass-based power plants.

Similarly, sector-specific references have been considered for verification of used/waste oil generation, as given in Table 5-6.

Table 5-6: Derived Waste Generation Factors from Compiled Data

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sector</th>
<th>WGF</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Airport</td>
<td>0.0068</td>
<td>0.0105</td>
</tr>
<tr>
<td>2</td>
<td>Aluminium</td>
<td>0.0024</td>
<td>0.0842</td>
</tr>
<tr>
<td>3</td>
<td>Automobile Servicing</td>
<td>0.0068</td>
<td>0.0105</td>
</tr>
<tr>
<td>4</td>
<td>Dairy</td>
<td>0.0065</td>
<td>0.1633</td>
</tr>
<tr>
<td>5</td>
<td>Distillery</td>
<td>0.0006</td>
<td>0.0268</td>
</tr>
<tr>
<td>6</td>
<td>Explosives</td>
<td>0.0001</td>
<td>0.0003</td>
</tr>
<tr>
<td>7</td>
<td>Ferrous</td>
<td>0.0038</td>
<td>0.0483</td>
</tr>
<tr>
<td>8</td>
<td>Fertilizers</td>
<td>0.0023</td>
<td>0.0206</td>
</tr>
<tr>
<td>9</td>
<td>Food</td>
<td>0.0090</td>
<td>0.0219</td>
</tr>
<tr>
<td>10</td>
<td>LPG</td>
<td>0.0005</td>
<td>0.0113</td>
</tr>
<tr>
<td>11</td>
<td>Metal, Road metal</td>
<td>0.0013</td>
<td>0.2100</td>
</tr>
<tr>
<td>12</td>
<td>Mining</td>
<td>0.0015</td>
<td>5.4537</td>
</tr>
<tr>
<td>13</td>
<td>Paints</td>
<td>0.0000</td>
<td>0.0006</td>
</tr>
<tr>
<td>14</td>
<td>paper</td>
<td>0.0036</td>
<td>0.0847</td>
</tr>
<tr>
<td>15</td>
<td>Pesticides</td>
<td>0.4360</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Plastics</td>
<td>0.0024</td>
<td>0.1391</td>
</tr>
<tr>
<td>17</td>
<td>R&amp;D</td>
<td>0.4425</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Rice mill</td>
<td>0.0069</td>
<td>0.6028</td>
</tr>
</tbody>
</table>
By availing waste generation factors in Table 5-1, Table 5-2 and Table 5-6, waste generation data reported by the industries has been checked for reliability. The algorithm for verification procedure is shown in Figure 5-4.

![Figure 5-4: Verification Process of Waste Generation for Suggesting Action Plan](image-url)

### Table 5-1

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Rigid PVC</td>
<td>0.0005</td>
<td>0.3532</td>
</tr>
<tr>
<td>20</td>
<td>Rubber</td>
<td>0.0001</td>
<td>0.0117</td>
</tr>
<tr>
<td>21</td>
<td>Soaps</td>
<td>0.0001</td>
<td>0.0057</td>
</tr>
<tr>
<td>22</td>
<td>Solvent extraction</td>
<td>0.0006</td>
<td>0.3616</td>
</tr>
<tr>
<td>23</td>
<td>Sponge iron</td>
<td>0.0005</td>
<td>0.0106</td>
</tr>
<tr>
<td>24</td>
<td>Steel</td>
<td>0.0017</td>
<td>0.0356</td>
</tr>
<tr>
<td>25</td>
<td>Sugar</td>
<td>0.0011</td>
<td>0.0096</td>
</tr>
<tr>
<td>26</td>
<td>Textiles</td>
<td>0.0045</td>
<td>0.2058</td>
</tr>
<tr>
<td>27</td>
<td>Tobacco</td>
<td>0.0024</td>
<td>0.5233</td>
</tr>
<tr>
<td>28</td>
<td>Yarn</td>
<td>0.0001</td>
<td>0.0002</td>
</tr>
<tr>
<td>29</td>
<td>Zinc</td>
<td>0.0133</td>
<td>0.2334</td>
</tr>
</tbody>
</table>
5.3.2 Verification of Appropriate Mode of Disposal

Appropriate mode of disposal of hazardous waste is a very important aspect in hazardous waste management. More often certain wastes can be effectively recovered with simple treatment, whereas those opportunities are not explored, some streams require incineration, whereas those are sent for land filling needing excessive stabilisation etc. If appropriate mode of disposal were adopted, then the resultant pressure on the receiving environment would be to its possible minimum. Therefore, CED-GreenOrigin reviewed, correctness of mode of disposal, as per the hierarchy among the available options is verified, for each industry-specific waste streams, as listed in Schedule-I, as it falls. Please refer, Appendix IV for hazardous waste stream-specific mode of disposal and Criteria/ Guidelines.

By availing Appendix IV for appropriate treatment and disposal methods, each industry-specific hazardous waste streams are re-organised into recyclable, incinerable and land-fillable wastes. The algorithm for verification procedure is shown in Figure 5-5.

![Figure 5-5: Verification Process for Appropriateness of Mode of Disposal of Hazardous Waste to Suggest Action Plan](image-url)
While the Appendix IV provides premise, specific rationale considered while deciding appropriate mode of disposal in respect of major hazardous waste streams in AP and Telangana States is given below:

1. Spent carbon:
   - Spent carbon can be sent to incineration if its calorific value (CV) and annealing losses are higher.
   - If adsorbable organic halides (AOx) are very low or under acceptable limits then it can go for co-incineration in cement plants, otherwise the waste shall be sent to common incinerator in TSDFs only, as these are provided with specific flue gas treatment system.

2. Organic residue:
   - If organic residue’s CV and annealing losses are higher, such waste needs to be sent for incineration.
   - Organic waste can be sent for co-incineration in cement plants, if adsorbable organic halides (AOx) are very low or under acceptable limits of CPCB, otherwise waste shall be sent for common incinerator in TSDF only, where flue gas treatment system including for dioxins is provided. In case of individual incineration facilities, adequacy of flue gas treatment system shall be ensured.

3. Oily sludge:
   - Oily sludge can go for co-incineration in cement pants if it falls under CRIT (C: Corrosivity, R: Reactivity, I: Ignitability, T: Toxicity) criteria provided such feeding system is available.
   - However, if waste contains oil and grease content less than 4%, then such waste can be sent for secured land-filling, provided qualifies water leachability test particularly for toxic metals.

4. Used oil/waste oil:
   - Used oil: If it qualifies Schedule 5, then it should go for recovery. The rejects from the recycling of used/waste oil facilities should be sent for incineration or Co-incineration.
   - Waste oil: Waste oil can be availed as fuel in boiler if it meets quality criteria as such or after treatment. It is not necessarily to be sent for energy recovery in incineration or co-incineration.

5. ETP sludge:
   - Bio-sludge can be used as manure after composting provided it meets the FAO criteria.
Inventorisation and Characterisation of Hazardous Waste Categories in Andhra Pradesh and Telangana - Contract no: 1A1.1 of the World Bank funded CBIPMP, APPCB

October, 2014

Final Report Submitted by Centre for Environment & Development, GreenOrigin Ventures Pvt. Ltd. and Lahmeyer GIW Consult GmbH

- Biological sludge arising from ETP plants of chemical, pharma, pesticides and organic chlorine containing persistent organic pollutants (POPs) shall not be preferred for bio-composting, until unless tested and proved to be safe.

- All ETP sludges having high annealing losses, if subjected to bio-remediation to bring down ‘loss on ignition’ to the permissible level, stabilize for toxic metal contents and meet the criteria for land filling can be sent for disposal in TSDF.

6. MEE & ATFD salts:
   - It has been observed in the analysed MEE & ATFD salt samples collected during study visits that annealing losses are in the order of 50-80% i.e. much higher than permissible limit of 20%. Therefore, such waste shall be sent for incineration / co-incineration if not affecting the product cement quality.
   - If such wastes are also found to contain halogenated organics higher than the permissible percentage for co-incineration, shall only be sent for incineration.
   - Wherever, the samples were collected, the appropriate disposal mode has been incorporated, in absence, retained land-disposal, considering higher halogens presence.

7. Inorganic salts & sludge: Inorganic salts & sludge can be sent to secure landfill, after required stabilisation.

8. Metal bearing waste/ scrap:
   - Metal bearing waste/sludge can be sent to secure landfill after stabilization.
   - Metal scrap is recoverable after decontamination, particularly in case of containers. The waste can go to furnaces where contamination of scrap can be taken care of.

9. Date expired chemicals: Date expired chemicals and off specification products shall only be sent to incineration facilities. These are not preferred to be sent for secured land filling due to their leachability concern.

10. Containers & container liners:
    - Containers should go for recycling after decontamination/detoxification. The activity shall be undertaken by SPCB authorized agencies only, if not the individual industries generating them.
    - Container liners can be sent for incineration or co-incineration.
11. Mixed spent solvents:
   • While spent solvents are recommended for recycling, mixed spent solvents can also be sent for recycling within the industry premises or through authorized recyclers.
   • Mixed spent solvents can be sent for incineration. Co-incineration is applicable, if halogen percentage and flash point are within the permissible limits. In general, if mixed solvents are not recyclable, shall be sent for incineration.

12. Distillation residue: Distillation residue can be directly sent for incineration/co-incineration.

13. Lead acid batteries: Lead acid batteries shall be sent for recycling.

14. Paint Sludge:
   • Paint sludge can be recoverable particularly in case of used paint from automobile factories other than from workshops through registered recyclers.
   • The waste paint sludge from manufacturing industries can be sent for incineration/co-incineration

15. Spent earth: Spent earth arising from vegetable oil refineries can be sent for bioremediation/sludge composting. It can be sent for secured land filling, if it complies with the criteria, either directly or after stabilisation.

16. Zinc dross/zinc ash: Zinc dross/ash can be sent for recycling and non-recyclable zinc sludge should be sent for secured land filling, after required stabilisation.

17. Spent catalyst: Spent catalysts from processes are in general recoverable. If not, these can be sent for secured-land filling after required stabilisation.

18. Chromium bearing sludge: Chromium can be recovered from the chromium sludge arising from tanneries, if possible. If not, can be sent for secured land filling after required stabilisation.

5.3.3 Verification of reported hazardous waste quantities sent to TSDFs, co-Incineration facilities and used oil/waste oil re-processors, if not recycled are disposed within the premises

Once a hazardous waste is generated, it is important that the waste is availed for beneficial applications to the extent possible, and later requires proper disposal. The disposal sinks for Hazardous wastes are either incineration (common incineration or individual incinerations
within the premises or co-incineration in cement kilns) or secured landfill disposal (either direct land filling of land filling after required stabilisation).

Movement of hazardous waste from source to disposal is not often a direct next step, as it changes its form and ultimately reaches the disposal sinks. Please see Figure 5-6 for the possible movement of Hazardous waste.

![Figure 5-6: Possible Movement of Hazardous Waste (Players)](image)

Middle man collection centers are reported to be detrimental, due to lack of accountability.

There are only 2 TSDFs i.e. one in Telangana region i.e. at Dundigal and Other is in Andhra Region i.e. at Visakhapatnam.

Hazardous waste received by these two facilities is captured for the study period i.e. April 2012 to March 2013 and are verified with the reported quantities by the individual industries.

Besides, many of the industries are sending their waste to co-incineration facilities as cost of co-incineration is substantially lower than the common hazardous waste incineration facilities located within the TSDFs. However, to note that the cement industries will not have extensive flue gas treatment facilities hence not all the types of wastes can be sent for co-incineration, in view of compliance with flue gas quality restrictions for cement industries. Whereas, it is observed that the individual industries are mixing several varieties of
wastes and sending a mixed waste to co-incineration facilities through some middlemen, at times. There are few cement industries accepting hazardous wastes for co-incineration. Efforts are made to collect the waste received by them during the study period for comparison purposes.

While it is studied that the used/waste oil processing facilities are not giving exact quantities and their processing capacities are often several fold higher than the licensed capacities. As such, the authorized facilities are competing each other to make sure they get relative share, however, there are unauthorized re-processers or adulterators who are a big threat to this reprocessing industry. Until unless the unauthorized handling through strict vigilance is observed, proper reprocessing cannot be ensured, which will result in urban air quality deterioration, as most of the fuels in urban areas are adulterated by these unprocessed used/waste oils in pre-decided portions.

CED-GreenOrigin verified whether generated wastes are reaching their final disposal destinations and affixed remarks.

5.4 District-wise Analysis of Information

A total of 2536 hazardous waste generating industries have been identified from multiple sources for HW accounting purpose. These numbers are conservative in nature i.e. while CED-GreenOrigin has sent questionnaire for more than 2500 Industries. Besides, there were few industries not accounted in earlier SPCB records, but are sending their hazardous waste to TSDFs have been tracked for inclusion in the list. Similarly, there were few removals and inclusions, as and when we received reliable information. Still there could be few industries, whose data is considered, but not be actively producing to its full capacity currently, as the complete details could not be ascertained during the project period through questionnaire surveys, industry visits, phone calls, and persuasion through Regional Offices of the Pollution Control Boards. Therefore, the estimates are conservative, which is desired for planning any infrastructure gap analysis and for framing policies.

A specific task of study visits to identified 31 industries has been accomplished by experienced professional Teams in association with regulatory Board officers, have generated huge data base on WGFs and current industry waste management practices, challenges etc. …
Verification checks by the Team of experts from industry, regulatory, planning further enhances the reliability of numbers that are going to be discussed in next Sub-sections.

Each-district specific data is processed for identifying major hazardous waste generating industries.

Again, Andhra Region and Telangana Region wide data compilation by combining respective districts has been conducted to draw state-specific indicative inferences and associated issues & challenges for drawing policy interventions.

Please refer district-wise inventory data of Andhra Pradesh (13 Districts) given in **Appendix V**.

### 5.4.1 Telangana State

Telangana region summary findings are as follows:

**A. Location and Size of the Telangana State**

Telangana State occupies an area of 114800 square kilometers. State is surrounded by AP, Karnataka, Maharashtra and Chhattisgarh.

**B. Number of industries identified relevant to hazardous waste generation**

2536 industries are identified as relevant to Hazardous waste in the Telangana State. Please refer **Appendix VI** for district-wise list of industries and their details. There are more than 100 industry sectors found relevant to hazardous waste generation under the Project.

**C. Used oil/ waste oil reprocessing facilities**

State generates a total of 20913.917 MT of used oil/waste oil. There are 7 registered used oil/waste oil processing industries having a total capacity of 88536 TPA. Means, Telangana state is having 67,622 MT of excess capacity. As such, M/s. Supreme Lubricants, Medchal, RR District, was visited by CED-GreenOrigin’s Team and observed that the capacity utilization is less than 2.5 %.

It is important to note that because of permitting such a huge recycling capacity plants, the capacity utilization rates are very low, challenging the survival of these facilities with pollution control measures.

….. fixing unauthorized oil dealers who are reportedly adulterate the virgin lube oil etc. would increase influx of used/waste oil for processing
Workshops and garages are the principle source of used/waste oil generation, where as these facilities are now not covered under the authorisation scheme of the pollution Control Boards. As such, it is given to understand that fixing unauthorized oil dealers who are reportedly adulterate the virgin lube oil etc. would increase influx of used/waste oil for processing.

This gap may be addressed, as it is not only affecting the authorized recyclers, but also plants and machinery besides air pollution.

D. Incinerable waste

State generates a total of 75633.99 TPA of incinerable waste. There are 45 cement industries excluding grinding units, whereas only 3 (Anjani, My home, & NCL) were reported to have received hazardous waste during 2012-13. Details are as follows:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Industry</th>
<th>Quantity, TPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjani Cement</td>
<td>6326.6 (Solid waste) + 5152.441 (liquid waste)</td>
</tr>
<tr>
<td>2</td>
<td>My Home Industry</td>
<td>4498</td>
</tr>
<tr>
<td>3.</td>
<td>NCL + Others</td>
<td>17389.78</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>33366.79</td>
</tr>
</tbody>
</table>

Dundigal TSDF having common incineration facility received a total quantity of 6727.242 TPA from Telangana 10 districts. As per the data available with SPCBs, the total incinerable waste reported to have received by cement industries all together for co-incineration, excluding Tadipatri facility in AP, is 33366.79 MT (i.e. in Telangana State).

Therefore, remaining incinerable waste (75633.99-6727.242=33366.79 MT) must have been dealt by the individual industries in their incineration facilities.

Dundigal TSDF was earlier serving 18 districts, whereas after the bifurcation, the jurisdiction may be restricted to 10 districts of Telangana, unless there is an agreement for interstate transportation of Hazardous wastes. This development reduces the influx of incinerable waste to TSDF facility, which further reduces the capacity utilization of already less utilized common incineration facility.

Therefore, as stated in case of Andhra Pradesh, CED-GreenOrigin’s Team is of the view that a Technical Committee may be formulated to look in to the adequacy of facilities at co-incineration facilities, manifestation systems, pricing mechanism, avoiding middle men in the system without proper authorisation of the Board, application of
regional criteria to ensure sustenance of the identified/authorized disposal facilities.

E. Land-fillable waste

State generates a total of 225877.78 TPA of land-fillable waste. Whereas, it was reported that only 99278.118 TPA from 10 districts of Telangana was received at Dundigal TSDF. It means most of the land-fillable waste is not reaching to the TSDF. This can be attributed to following:

1. The industries are not clearing the generated waste immediately; instead, the same is accumulating within their premises. Therefore, the generation and disposal are hugely differing. This clearance of HW from the industries within the statutory periods is an enforcement issue.

2. It is observed that most of the waste is mixed within the industries to make it transportable up to co-incineration facilities. For this mixing, often the waste i.e dried salts, FE salts, etc. which otherwise are suitable for land filling, are now rerouted to co-incineration facilities. This shift is changing the dynamics of the HW flows in the State. CED-GreenOrigin is of the View that the mixing taking place in some of the bulk drug industries is attached with high degree of safety and risk concerns.

3. It is evident that price difference in mode of disposal i.e. Co-incineration and TSDFs is the principle reason driving the industries to adopt mixing of wastes etc. for cost-effectiveness, while it is attached with safety and risk considerations.

4. Therefore, as suggested earlier a Committee should be constituted to set the pricing mechanism to streamline the waste management in the State.

5. TSDF in Dundigal was earlier serving 18 districts i.e. other than 5 coastal districts - Srikakulam, Vizianagaram, Visakhapatnam, West Godavari and east Godavari. Whereas, due to state bifurcation, now the same facility is to serve only 10 districts in Telangana. Therefore, correspondingly the influx of HW will reduce at Dundigal TSDF.

F. Other Specific Observations

1. Tank bottom sludge is not being reflected in the inventories; as the industries are cleaning the tanks with varying time periods say, once in 6-10 years, therefore, it is not a yearly phenomenon.
As and when the tanks are cleaned-up, it requires reporting. For example, HPCL Visakhapatnam is holding 6000 KL for a long period in separate holding tanks, without authorisation/information to the Board.

Whereas, whenever, they empty the tanks, the bottom sludge quantity is substantially higher for recovery followed by proper disposal. It is to be noted that recycling facilities are equipped for used/waste oil only and not for oily sludges. This clarification need to be circulated to the regulatory officers, so that the industry takes appropriate action.

2. Lead acid batteries are almost used by the industries and at the end of used life, are disposed to the recyclers as per the Battery Rules. Some industries reported used batteries in numbers and some in quantity. As the conversion of quantity into nos. is not possible, we retained the figures as reported. As such, CED-GreenOrigin is of the view, that the industries are sending the used batteries for recycling, as per the Battery Rules and therefore are not coming to TSDFs.

3. It has been observed that the used drums contaminated with various chemicals are not being cleaned properly by the industries. It is an essential requirement to ensure proper cleaning of the drums before they leave the premises of the industries or else, it should be sent to TSDF facility having authorized decontaminating system. In absence of such system, these drums are used for several purposes, not necessarily for the same chemical carrying purposes, posing health risk to the end users. Ignorance of the public to the contaminants in these drums are often reflecting to fatal incidents, hence is a gap in the system, requiring intervention by the regulatory Board.

4. CED-GreenOrigin is of the view that following are to be enforced:
   a. Industry shall clean the drums and ensure that these are free from all the reminisces of the chemicals, before sending them out of their premises.
   b. If not, shall be sent to an authorized cleaners only (as of now, no authorized cleaner is reported).
   c. SPCB shall authorize the drums cleaning and resale dealers

5. CED-GreenOrigin made untiring efforts in compiling data from multiple sources and application of QA/QC checks, such a rigorous exercises can be streamlined by ensuring proper documentation from the industries and by maintaining proper records and sending to the Board – preferably soft data with inbuilt crosschecks.
6. To achieve point no. 5 above, there is a definite need for enhancing awareness on type, characteristics of hazardous waste, analysis needed at dumpsites including for stabilized/treated wastes before landfilling to meet criteria of land filling, proper storage, incineration of waste etc.

7. It is also observed that most of the industries visited are operating on the basis of deemed consent. It shows that the decision regarding permission or rejection could not be taken timely, perhaps because of the complex reactions, time that takes in reviewing and required professional inputs. CED-GreenOrigin Team is of the view that a technically sound Team / firm may be engaged to review on behalf of the Board for facilitating the decision making besides constituting a Technical Committee specifically for chemical industries. It may be noted that deemed consent in respect of synthetic organic chemical industries implies any reaction can be performed at any time in any quantity that the industry considers fit (submitted through application but without concurrence of the Board on preparedness in case of routine and emergencies) – which is a significant concern.

8. Proper stacking, identification, demarking, conspicuous identification and space for inspection around are a significant issue in all the chemical industries, requiring immediate consideration.

9. HW storage sheds are prone to fire, thus safety is a concern. Therefore, flameproof fittings shall only be installed.

10. The CED-GreenOrigin’s Team is concerned about health of the workers handling hazardous waste, particularly those who are mixing different wastes for disposal through co-incineration facilities.

11. The concept of zero discharge is converting entire solids in wastewater into a solid/hazardous waste. So the net quantity of hazardous waste generation is increasing, whereas, the generated waste instead of reaching its designated land-fills for disposal, getting mixed with organic residues and spent carbon etc. to form a mix suitable for co-incineration, as a result, posing additional risk in its entire life cycle (safety, health of workers, air pollution due to VOCs, transportation risk, handling of this complex waste in cement plants, inadequate flue gas treatment in cement industries etc.).
12. Housekeeping specifically in and around storage and ETP areas requires improvement across the industries.

Please refer district-wise inventory data of Telangana (10 Districts) given in Appendix V.
6.0 SPATIAL DATA BASE GENERATION, PROCESSING AND ANALYSIS

There are 56 industrial estates and 205 industrial parks in the State of pre-bifurcated Andhra Pradesh, covering their presence in all the 23 districts. Please refer Figure 6-1 showing all industrial areas. While maximum industries are falling in the established industrial estates, there are isolated industries, as well, generating hazardous waste.

Figure 6-1: Location of Industrial Areas / Parks
Entire state has been digitized up to village levels and the location of the industries have been identified by the combination of following:

1. **Industry locations at 1:25000 mapping**: Softcopy dataset for the entire state has been prepared up to village level and the location of the industries have been finalized by the combination of following, aimed at achieving high location accuracy.

2. Latitude and longitudes given by the industries in their questionnaires – Verified on base map and previously available datasets

3. GreenOrigin obtained data on location of the hazardous waste generating industries in the State

4. Plotting of industry locations availing address and open source GIS datasets

5. Procurement of data from readily available sources dealing with industries

6. Deployment of Project tied staff for locating the industries with Lat Longs, which could not be tracked or tapped by other sources for identification using above approach and contacting the industries – accuracy meeting the standards at 1:25000 scale. The field teams have also verified the locations of industries already captured.

7. Capturing the boundaries of large industries, particularly in Hyderabad and Visakhapatnam region, meeting the accuracy standards at 1:10000 scale.

8. District-wise location of all identified hazardous waste generating industries are located and GIS maps are given in attached CD.

Regional coverage of the existing TSDFs and no. of hazardous waste generating industries and the industries falling in the coverage area are also developed.

Incinerable waste generating industries, co-incineration/common incineration facilities locations are identified to show, how zoning criteria can reduce the risk during transportation of HW.

Current location of TSDFs and new challenges emerged due to bifurcation of the State are shown in maps and analysed i.e. hazardous waste generated in south of new Andhra Pradesh needs to
be transported to Vizag which is on north of Andhra Pradesh, imposing huge transportation distances, which is not desired due to higher risks and transportation costs. Therefore possible areas for development of new TSDF that optimizes costs are discussed, with the support of spatial data analysis. GIS maps with data covering AP and Telangana separately are given in Appendix VII (separate CD is attached).

Maps from the base map dataset and industry locations are shown in Figure 6-2 to Figure 6-6.

![Figure 6-2: Admin Boundaries, Connectivity and Major Towns (Pre Bifurcated)](image-url)
Figure 6-3: Village Boundary Data (Zoomed-in Village Map)
Figure 6-4: Industrial Location in Telangana State Mapped at 1:10000 scale
Figure 6-5: Location of industries Mapped at 1:10000 scale in AP State
Figure 6-6: Location of Industry
7.0
SUMMARY OBSERVATIONS, INFERENCES AND WAYFORWARD

7.1 Summary Observations

1. Study area includes 10 districts in Telangana State, as per the Andhra Pradesh Reorganization Act, 2014 w.e.f. June 2, 2014.

   Districts in Telangana State include Adilabad, Hyderabad, Karimnagar, Khammam, Medak, Mehboobnagar, Nalgonda, Nizamabad, Rangareddy and Warangal.

2. The study findings are processed geographically and industry-sector wise. Geographically, district-wise data has been processed and inferences drawn. Similarly, for industry-sectoral analysis, entire 23 districts data has been considered, as more the number of industries, more the reliability of WGFs.

3. Current report presents entire scope of work.

4. Approach adopted for inventorisation of hazardous waste generation is shown in Figure 2-1, which comprises of i) dry data collection through questionnaire survey; ii) Data review and analysis; iii) in-depth studies to cross check provided data and to establish waste generation factors; iv) spatial data base generation; v) Inferences and way-forward


6. Questionnaire survey conducted from August 22, 2013 onwards in several phases.

7. Functions of different organisations, which are involved in administering regulation of industrial activities, such as Pollution Control Board, Commissionerate of Industries, APIIC, Directorate of Factories and others were reviewed. Summary view of the analysis is as follows:
The list available with the APPCB is much more relevant as it is the list verified and authenticated by the Regional Offices after thorough review of the industrial process and upon inspection.

Directorate of Factories issues permission for those industries, which have 10 or more workers and falls in the list of operations identified under the Factories Act, only. Therefore, the list may provide industries, but all of them may or may not be relevant to hazardous waste, and as such, the list does not represent entire possible hazardous waste generating industries. Therefore the list would be a sub-set of industries listed with Commissionerate of Industries.

Entire list of industries available with Commissionerate of Industries (pre-bifurcation of State) reveals that 1,00,195 (4520 large and medium scale industries; 95675 are small scale industries, and Small and micro enterprises together; Large, medium and small scale units are defined as more than rupees 10 crores, 5-10 crores and less than 5 crores investment on plant and machinery, respectively) industries are registered in Andhra Pradesh (pre-bifurcated), so far. Registration with Commissionerate of industries does not mean that these industries are in operation since then, but are just registered to pursue the projects for their establishment and operation. It means this is an indicative list of industries only and not necessarily the list of industries, which are in operation. As such the list also classified in respect of Large and medium scale industries, and small scale and small & micro enterprises. It may be worth to mention that industrial operations are classified into red, orange and green category. Others beyond this list are considered to be non-polluting and do not require to take CFE/CFO from the pollution control Board. Therefore, the relevance of the industries to pollution is limited to red, orange and green categories only emphasizing large and medium scale.

a. Short listing of industries for questionnaire survey include following:

List of industries to which HW authorisation has been issued in 2010 was considered as first list for issuing questionnaire (3222 in no.) in 23 districts of pre-bifurcated AP.

List of new industries to which consent for operation issued during Jan-Dec, 2012 and not covered in point “a” was considered as second list for issuing questionnaire.
9. A detailed questionnaire in consultation with APPCB and the World Bank has been designed and same is sent to all the identified industries. To ensure reporting all relevant streams, questionnaire is attached with industry sector-specific possible/relevant Schedule-I and Schedule-II hazardous waste streams.

10. Questionnaires have been issued to the industries in 23 districts (pre-bifurcation) following stages, with a copy to CEE, JCES, concerned Zonal Officers and Regional Officers of APPCB:

- Phase-I : Questionnaires couriered to 3209 industries in between August 22 and September 12, 2013.
- Phase-II & III : Questionnaires couriered to 1444 industries in between December 5 and December 23, 2013.
- Phase-IV : Questionnaires couriered to 63 industries in between December 25 and December 28, 2013.

11. All the 10 districts in TS are having hazardous waste generating industries. The district-wise number of hazardous waste generating units are given in Table 7-1.

Table 7-1: District-wise Distribution of Hazardous Waste Generating Industries

<table>
<thead>
<tr>
<th>S No</th>
<th>District</th>
<th>No. of Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adilabad</td>
<td>41</td>
</tr>
<tr>
<td>2</td>
<td>Hyderabad</td>
<td>145</td>
</tr>
<tr>
<td>3</td>
<td>Karimnagar</td>
<td>231</td>
</tr>
<tr>
<td>4</td>
<td>Khammam</td>
<td>58</td>
</tr>
<tr>
<td>5</td>
<td>Mahaboobnagar</td>
<td>187</td>
</tr>
<tr>
<td>6</td>
<td>Medak</td>
<td>667</td>
</tr>
<tr>
<td>7</td>
<td>Nalgonda</td>
<td>252</td>
</tr>
<tr>
<td>8</td>
<td>Nizamabad</td>
<td>42</td>
</tr>
<tr>
<td>9</td>
<td>Rangareddy</td>
<td>857</td>
</tr>
<tr>
<td>10</td>
<td>Warangal</td>
<td>56</td>
</tr>
</tbody>
</table>

Sub Total = 2536
12. District-wise list of industries relevant to hazardous waste is given in Appendix V (Andhra Pradesh) and Appendix VI (Telangana).

13. Sector-wise hazardous waste generating industries are presented in Table 7-2.

Table 7-2: Sector Wise Number of Hazardous Waste Generating Industries

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Industry Sector</th>
<th>No. of Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Airport and Commercial Air Strips</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Aluminium smelter</td>
<td>45</td>
</tr>
<tr>
<td>3.</td>
<td>Asbestos and asbestos based industries</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>Automobiles Manufacturing (Integrated facilities)</td>
<td>16</td>
</tr>
<tr>
<td>5.</td>
<td>Basic chemicals and electro chemicals and its derivatives including manufacture of acids</td>
<td>324</td>
</tr>
<tr>
<td>6.</td>
<td>Ceramic, Refractories</td>
<td>22</td>
</tr>
<tr>
<td>7.</td>
<td>Cement</td>
<td>45</td>
</tr>
<tr>
<td>8.</td>
<td>Chlor Alkali</td>
<td>0</td>
</tr>
<tr>
<td>9.</td>
<td>Coal washeries</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>Copper smelter</td>
<td>17</td>
</tr>
<tr>
<td>11.</td>
<td>Coke making, liquefaction, coal tar distillation or fuel gas making</td>
<td>0</td>
</tr>
<tr>
<td>12.</td>
<td>Common Treatment and disposal facilities (CETP &amp; TSDF)</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>Distillery including Fermentation industry</td>
<td>11</td>
</tr>
<tr>
<td>14.</td>
<td>Dyes and Dye-intermediates</td>
<td>8</td>
</tr>
<tr>
<td>15.</td>
<td>Dry coal processing / mineral processing, industries involving ore sintering, palletization, grinding</td>
<td>9</td>
</tr>
<tr>
<td>16.</td>
<td>Fermentation industry including manufacture of yeast, beer, distillation of alcohol (ENA)</td>
<td>23</td>
</tr>
<tr>
<td>17.</td>
<td>Fertilizer (basic) (excluding formulation)</td>
<td>15</td>
</tr>
<tr>
<td>18.</td>
<td>Ferrous and Non Ferrous metal extraction involving different furnaces through melting, refining, reprocessing, casting and alloy making.</td>
<td>14</td>
</tr>
<tr>
<td>19.</td>
<td>Fibre glass production and processing (excluding moulding)</td>
<td>9</td>
</tr>
<tr>
<td>20.</td>
<td>Health care establishment (as defined in BMW Rules)</td>
<td>1</td>
</tr>
<tr>
<td>21.</td>
<td>Heavy engineering including Ship Building (with investment on Plant &amp; Machineries more than Rs. 10 crores)</td>
<td>2</td>
</tr>
<tr>
<td>22.</td>
<td>Hot mix plants</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Code</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>23.</td>
<td>Hotels (3 Star &amp; above) having 100 rooms and above.</td>
<td>24</td>
</tr>
<tr>
<td>24.</td>
<td>Industrial carbon including electrodes and graphite blocks, activated carbon, carbon black</td>
<td>3</td>
</tr>
<tr>
<td>25.</td>
<td>Industrial inorganic gases namely: Chemical gases, acetylene, hydrogen, chlorine, fluorine, ammonia, sulphur dioxide, ethylene, hydrogen sulphide, Phosphine Hydrocarbon gases, Methane, ethane, propane</td>
<td>25</td>
</tr>
<tr>
<td>26.</td>
<td>Industry or process involving foundry operations.</td>
<td>0</td>
</tr>
<tr>
<td>27.</td>
<td>Industry or process involving metal surface treatment or process such as pickling / plating /electroplating / paint stripping / heat treatment / Phosphating or finishing and anodizing / enameling / galvanizing.</td>
<td>31</td>
</tr>
<tr>
<td>28.</td>
<td>Iron and Steel (involving processing from ore / integrated steel plants and or Sponge Iron Units.)</td>
<td>157</td>
</tr>
<tr>
<td>29.</td>
<td>Isolated storage of Hazardous Chemicals (as per schedule of Manufacture, Storage &amp; Import of Hazardous Chemicals Rules, 1989 as amended)</td>
<td>14</td>
</tr>
<tr>
<td>30.</td>
<td>Lead Acid battery manufacturing (excluding assembling &amp; charging of acid lead battery in micro scale (&lt;Rs. 25 lakhs)</td>
<td>11</td>
</tr>
<tr>
<td>31.</td>
<td>Lime manufacturing (using Lime Kiln)</td>
<td>0</td>
</tr>
<tr>
<td>32.</td>
<td>Manufacturing of Explosives, detonators, fuses including management and handling activities.</td>
<td>22</td>
</tr>
<tr>
<td>33.</td>
<td>Manufacturing of Glass</td>
<td>10</td>
</tr>
<tr>
<td>34.</td>
<td>Manufacturing of Lubricating oils, greases or petroleum based products</td>
<td>10</td>
</tr>
<tr>
<td>35.</td>
<td>Manufacturing of Paints, Varnishes, pigments and intermediate (excluding blending /mixing)</td>
<td>17</td>
</tr>
<tr>
<td>36.</td>
<td>Manufacturing of Starch / Sago</td>
<td>2</td>
</tr>
<tr>
<td>37.</td>
<td>Milk processing and dairy products (integrated project)</td>
<td>25</td>
</tr>
<tr>
<td>38.</td>
<td>Mineral stack yards / Railway sidings</td>
<td>0</td>
</tr>
<tr>
<td>39.</td>
<td>Mining and ore beneficiation</td>
<td>26</td>
</tr>
<tr>
<td>40.</td>
<td>New highway construction projects</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Non alcoholic beverage (soft drinks) &amp; bottling of alcoholic / non-alcoholic products (capital investment on plant &amp; machinery &gt;Rs. 1 crore)</td>
<td>1</td>
</tr>
<tr>
<td>42.</td>
<td>Oil &amp; Gas extraction including CBM (offshore)</td>
<td>0</td>
</tr>
<tr>
<td>Category</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>&amp; onshore extraction through drilling wells</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Oil and gas transportation pipeline</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Oil Refinery (Mineral Oil or Petro Refineries)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Parboiled rice mills (more than 10 TPD)</td>
<td>296</td>
<td></td>
</tr>
<tr>
<td>Pesticides (Technical) (excluding Formulation)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Petrochemicals (Manufacture of and not merely use of as raw material)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Pharmaceuticals (excluding formulation)</td>
<td>212</td>
<td></td>
</tr>
<tr>
<td>Pulp and Paper (paper manufacturing with or without pulping)</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Photographic films and its chemicals</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ports &amp; Harbours, Jetties and Dredging operations</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Power Generation Plants (except Wind, Solar and Mini Hydel Power plants of capacity &lt;25 MW) and D.G. set of capacity &gt; 5 MVA.</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Railway Locomotive workshops / Integrated Road Transport workshop / Authorized service centers.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Reprocessing of used oils and waste oils</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Ship breaking activities</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Steel and steel products using various furnaces like blast furnaces / open hearth furnace / induction furnace / arc furnace / submerged arc furnace / basic oxygen furnace / hot rolling using reheating furnaces</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>Stone crushers</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Sugar (excluding Khandsari)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Surgical and medical products involving prophylactics and latex</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Synthetic detergents and soaps (excluding formulation)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Synthetic fibers including rayon, tyre cord, polyester filament yarn</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Synthetic resins</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Synthetic rubber excluding molding</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Tanneries</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Tobacco products including cigarettes and tobacco / opium processing</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Vegetable oils including solvent extraction and refinery / hydrogenated oils</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Yarn / textile processing involving any effluent / emission generating process, bleaching, dyeing, printing and scouring</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Zinc smelter</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>
14. Eight industry sectors were identified by CBIPMP for in-depth studies, and 31 industries in these sectors were covered by CED-GreenOrigin.

15. Specific observations on the industrial sectors, which were visited by CED-GreenOrigin, are discussed in detail in Chapter V.

16. Visited industries and responded questionnaires together account for 23.68% on quantity basis and additional form IVs and major industries authorization letters together makes 48.78% of total HW generation in both the states together. Besides, TSDF data further facilitated additional 13.27%, which is considered as reliable. Remaining share of HW quantity is based on the data filed by the industries/entered by Regional Offices in XGN database of APPCB and others.

17. Specific design of the questionnaires has benefited the survey, as it facilitated reporting concerned hazardous waste generating sources.

18. It is also observed that not all the industries in a sector reported all the kinds of hazardous waste streams, but quantity is summarized mostly being auxiliaries. The information in specific may be ascertained by SPCBs before issuing next year authorization to these industries.

19. Some of the industries, which are the major producers of the hazardous waste, are of the opinion that the waste that is being recycled within the industry need not be shown as hazardous waste although as per the Rules they fall under hazardous waste category. However, it was made clear that it is required to report all the sources and the quantity of hazardous waste generation first and then to record the type and quantity of the same as reused/re-cycled for other purposes either within the industry or out-side the industry. This major clarification also altered the quantities of hazardous waste generation w.r.t. earlier reported quantities.

20. **Field visits**: CED-GreenOrigin Team in consultation with APPCB identified 31 industries for field visits. These studies were intended to verify the information and to witness the hazardous waste management practices with in the premises. List of industries studied under the Project are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Others</th>
<th>617</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>2536</strong></td>
</tr>
</tbody>
</table>
21. **Bulk-drug industries:**

1. M/s. Aurobindo Pharma Ltd., Unit- V, IDA, Pashamylaram, Patancheru (M), Medak District. (SRD-I)
3. M/s. Piramal Health Care Ltd (Unit-I), Digwal (V), Kohir (M), Medak Dist.
4. M/s Astrix Laboratories Ltd. (Formerly M/s Matrix Laboratories Ltd., Unit - II), Sy. No. 10 & 42, Gaddapotharam Village, Jinnaram Mandal, Medak District
5. M/s Virchow Chemicals (P) Ltd., Sy. No. 10, Gaddapotharam (V), Jinnaram (M), Medak District.
7. M/s. Divis Laboratories Ltd., Unit - II Chippada (V), Bhimili (M), Visakhapatnam
8. M/s. Aurobindo Pharma Limited, IDA, Pydibheemavaram (V), Ranaasthalam (M), Srikakulam District.
9. M/s Keke Pharma Ltd., Sy. No. 180/1 to 15, Khazipally Village, Jinnaram (M), Medak District
10. M/s. SMS Pharmaceuticals Ltd., Industrial Estate, Sy.No.180, Khazipally (V), Jinnaram (M), Medak District.
11. M/s. Aurobindo Pharma Ltd., Unit-IX, Sy. No. 371, Gundlamachanooor (V), Hatnoor (M), Medak Dist.

**Power plant (Coal based)**

13. M/s. My Home Industries Merchant power plant – 60 MW

**Power Plant (biomass based):**


**Cement industry:**

15. M/s. My Home Industries Ltd., Mallacheruvu, Nalgonda – one of the largest cement producers in the State

**Cement industry, which adopted co-incineration of HW:**

16. M/s. Anjani Port Land Cement Ltd., Nalgonda – Reported to be the largest HW handling cement industry for co-incineration.

**Sponge Iron Plants**

17. M/s. Steel Exchange Ltd. has been studied.

**Galvanising units:**

19. M/s. Reliance Galvanising Industries Plot no. 15 Rd. No. 2, Bhagyanagar Co-op Industrial estate, Balanagar, RR District;  

**Electro-plating units:**
21. M/s. ECIL, IDA, Cherlapally, RR District; or  
22. M/s. Hindustan Aeronautics Ltd., Balanagar, RR District

**Petroleum refineries:**
23. M/s. HPCL Malkanuram Visakha Refinery, Visakhapatnam  
24. M/s. ONGC, Mini refinery, Thatipaka, EG District.

**Edible oil extraction unit:**

**Waste Oil reprocessing unit:**

**CETPs**
27. Jeedimetla Effluent Treatment Ltd., Plot no. 267 Phase-I, IDA, Jeedimetla, RR District.  
29. CETP of M/s. Ramkey Pharmacity (I) Ltd., Pharmacity, Parawada

**TSDFs**
31. M/s. Coastal Waste Management Project – CWMP, Pharma City, Parawada, Visakhapatnam

CED-GreenOrigin Team prepared each industry-specific report, processing the entire information made available by the industries. The reports are organized to present precise product profile of the industry, manufacturing process, sources of waste generation, characteristics, mode of collection, storage, treatment and disposal. Besides, field observations on the overall hazardous waste management in the industry and sectoral issues were also recorded.

22. **Team involved:** A professional Team comprising Former EE, CPCB and VP-IL&FS, former Additional Director (Chemical Industry), former Additional Director (Hazardous Waste Management), former Chief Engineer, MNC chemical industry, Former VP-Infotech, and MoEF & NABL recognised laboratory & staff, and GIS Team, having extensive experience in inventorisation and management of hazardous waste
designed the approach, inspected the industries and reviewed findings. Professional Team is supported by 6 engineers, several data entry & GIS professionals including laboratory staff for sampling and analysis.

23. Waste generation Factors: Waste generation factors have been developed for sectors, where minimum set of values are available for reasonable statistical evaluation. As such, WGFs developed during the field studies, CPCB reference values, were extensively used and for remaining gaps, existing industry statistics have been considered for arriving at reference values for extrapolation.

By doing this extensive exercise, a master file has been prepared, covering recyclable, incinerable and land-fillable waste generation from each of the identified hazardous waste generating industries.

Classification of wastes into recoverable, incinerable and land-fillable has been arrived based on actual reported values by the industry, and where not available, the Appendix IV guiding the choice of treatment has been considered for classifying the waste besides specific guidance for major streams discussed earlier in this Report. Re-organisation of categories of HW as per the guidance given at Section 5.3.2 in this Report, facilitated to arrive at percentages of the HW in respect of recyclable, incinerable and land disposable nature.

24. Sector-wise observations

Entire industry in AP & Telangana together are classified into more than 100 different sectors in accordance to the industry sectors identified under Red, Orange and Green categories of industries, for identifying sector-specific HW streams. Now the same classification is used for understanding the sector-wise HW generation. Please refer Table 7-3 for sector-wise hazardous waste generation in TS.
Table 7-3: Industry Sector-Specific Generation of Hazardous Waste in Telangana

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Major Sector</th>
<th>Total Quantity</th>
<th>% Share of Total State Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bulk Drug</td>
<td>214662.487</td>
<td>37.631</td>
</tr>
<tr>
<td>2</td>
<td>Chemical</td>
<td>115247.014</td>
<td>20.203</td>
</tr>
<tr>
<td>3</td>
<td>Paper</td>
<td>32946.069</td>
<td>5.776</td>
</tr>
<tr>
<td>4</td>
<td>Pharma</td>
<td>32927.254</td>
<td>5.772</td>
</tr>
<tr>
<td>5</td>
<td>Iron Ore &amp; Steel</td>
<td>3522.660</td>
<td>0.618</td>
</tr>
<tr>
<td>6</td>
<td>Vegetable oil</td>
<td>3184.964</td>
<td>0.558</td>
</tr>
<tr>
<td>7</td>
<td>Galvanizing</td>
<td>3156.970</td>
<td>0.553</td>
</tr>
<tr>
<td>8</td>
<td>Sponge Iron</td>
<td>1229.169</td>
<td>0.215</td>
</tr>
<tr>
<td>9</td>
<td>Power</td>
<td>578.204</td>
<td>0.101</td>
</tr>
<tr>
<td>10</td>
<td>Cement</td>
<td>520.901</td>
<td>0.091</td>
</tr>
<tr>
<td>11</td>
<td>Rice mill</td>
<td>212.416</td>
<td>0.037</td>
</tr>
<tr>
<td>12</td>
<td>Oil Recycler</td>
<td>159.250</td>
<td>0.028</td>
</tr>
<tr>
<td>13</td>
<td>Oil Refining</td>
<td>48.783</td>
<td>0.009</td>
</tr>
<tr>
<td>14</td>
<td>Electroplating</td>
<td>49.821</td>
<td>0.009</td>
</tr>
<tr>
<td>15</td>
<td>Others</td>
<td>161989.169</td>
<td>28.397</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>570435.132</td>
<td>100</td>
</tr>
</tbody>
</table>

The Table 7-3 reveals that maximum HW is generated from Bulk-drugs and pharma sector (43%). Chemical synthesis industry having wide range of products follows the next i.e. 20.2% of total HW generation.

All other sectors generate comparatively less quantity of hazardous waste.

25. **District-Wise Observations**

Telangana has 10 districts and each district is generating HW. District-specific HW generation is given in Table 7-4.

Table 7-4: District-Specific Generation of Hazardous Waste in Telangana

<table>
<thead>
<tr>
<th>S. No.</th>
<th>District</th>
<th>Recyclable Waste, TPA (a)</th>
<th>Incinerable Waste, TPA (b)</th>
<th>Land-fillable Waste, TPA (c)</th>
<th>Total HW generation (a+b+c)</th>
<th>% Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adilabad</td>
<td>143.767</td>
<td>80.04</td>
<td>3171.81</td>
<td>3395.62</td>
<td>0.595</td>
</tr>
<tr>
<td>2</td>
<td>Hyderabad</td>
<td>999.938</td>
<td>615.516</td>
<td>1655.159</td>
<td>3270.62</td>
<td>0.573</td>
</tr>
<tr>
<td>3</td>
<td>Karimnagar</td>
<td>126.876</td>
<td>22.309</td>
<td>31.045</td>
<td>180.23</td>
<td>0.032</td>
</tr>
<tr>
<td>4</td>
<td>Khammam</td>
<td>2835.915</td>
<td>231.509</td>
<td>46902.06</td>
<td>49969.48</td>
<td>8.760</td>
</tr>
<tr>
<td>5</td>
<td>Mahaboobnagar</td>
<td>6164.868</td>
<td>1424.11</td>
<td>10652.252</td>
<td>18241.23</td>
<td>3.198</td>
</tr>
<tr>
<td>6</td>
<td>Medak</td>
<td>154085.2</td>
<td>37094.143</td>
<td>62492.732</td>
<td>253672.08</td>
<td>44.470</td>
</tr>
<tr>
<td>7</td>
<td>Nalgonda</td>
<td>45959.168</td>
<td>20140.472</td>
<td>34117.848</td>
<td>100217.49</td>
<td>17.569</td>
</tr>
<tr>
<td>8</td>
<td>Nizamabad</td>
<td>91.054</td>
<td>72.14</td>
<td>39</td>
<td>202.19</td>
<td>0.035</td>
</tr>
</tbody>
</table>
a. All 10 districts generate hazardous waste, while Karimnagar and Nizamabad share is almost negligible.

b. Medak district generates maximum (44.47%) and next comes Rangareddy (23.8%), Nalgonda (17.56%).

c. Chemical industries are concentrated in and around Hyderabad i.e. in Medak, Nalgonda, and Rangareddy districts.

### 7.2 Inferences

Waste management systems involve two approaches i.e. preventive and reactive.

Preventive strategy includes following:

- Improvement in process technology and equipment which may completely eliminate or reduce the waste generation,
- Improvement in plant operation, and
- Promotion of use of process wastes in the form of recovery/recycling/reuse of waste.

Reactive approach refers to the strategies once the waste is generated despite aforementioned efforts i.e. safe disposal. Disposal can be in the form of incineration/co-incineration or to the secured landfill. If the hazardous waste consists of calorific value such as solvent residues, contaminated solvents and others, then such waste is suitable for incineration in respect of cost of operation; otherwise, auxiliary fuel costs would be very high. If it is not feasible, then the characteristics are to be seen for their suitability for direct disposal into secured landfill facility. If not, waste requires stabilization before secured-disposal.

#### 7.2.1 Focus on few industry sectors can bring major change

Processed data reveals that more than 50% of hazardous waste in both states is generated only from Bulk-dugs & pharma and chemical industries. Diversity of products, process reactions and unit operations in synthetic organic chemicals manufacturing industries makes the task of suggesting cleaner technologies complex.

The SPCBs have officers from different qualifications and backgrounds, while any post graduation with atleast 10 years of
experience in dealing with chemical industry with adequate regular trainings and capacity building programmes are necessary to handle the chemical industries particularly synthetic organic chemical industries involved in batch processes such as bulk-drugs.

Therefore, Boards may regularly organize capacity-building programmes not only for Board officers, but also for plant personnel, so that the gap in enforcement can be reduced from both the sides, for overall environmental improvement.

7.2.2 Waste recycling

Segregation and recycling/reuse are practiced in the large-scale industries. While there are established recycling and waste minimization opportunities, not all the industries availed the same for various reasons i.e. absence of network of industries, by-product exchange facilitating clubs, scale of operation, transportation costs etc.

Local demand for the recycled product is often a constraint; therefore, the waste even though recyclable in nature is being temporarily stored and over the time sent for secured disposal. These additional temporary storages are often challenging the statutory storage periods.

7.2.3 Promotional measures for waste minimization and environmentally sound management

SPCBs may regularly explore possibilities to conduct workshops on “Waste Minimization and Handling of the Hazardous Waste” by inviting atleast major 25 hazardous waste generating industries in each district. A specific programme, in the lines of the corporate responsibility for environmental protection (CREP) programme of the Central Government may be designed i.e a voluntary agreement for year-wise hazardous waste minimisation plans and targets. Such a move coupled with introduction of Rolling Shield for best performing Industry, may boost morale of the industries in adopting better management practices.
7.2.4 Incinerable waste management

Both TSDFs have common incineration facilities within the premises to handle incinerable waste. Dundigal facility was serving 18 districts due to geographical proximity and Visakhapatnam facility was serving 5 coastal districts. Whereas, after bifurcation of the State, the serving areas corresponds the respective districts in each state. Please refer Figure 7-1 giving the details of the incinerable hazardous waste reported to have received from each district to respective TSDFs. Figure 7-1 also shows the pre and post bifurcation of State serving areas.

Figure 7-1: District-wise Incinerable Waste Reaching TSDFs at Dundigal and Parawada
Figure 7-2: Incinerable Waste Generation from AP and Telangana Areas
Incinerable waste generation is not uniformly distributed across the Districts. Therefore, the location of either common incineration facilities or co-incinerating facilities needs to be geographically distributed, so that optimization of costs in respect of transportation could be reasonably explored. This regional spread and geographical distribution reduces high-risk waste transportation across the State.

It may be seen that operation of a common incineration facility requires minimum 1 t/hr capacity for operational ease (cut-off capacity).

It is pertinent to mention that the industries over the years in AP and Telangana regions realized the importance of characteristics based segregation of HW streams for respective disposal mode. Whereas, introduction of co-incineration facilities broke the monopoly of TSDFs and brought in open market competition in case of incinerable waste.

While, this offered a significant financial relief to industry, forced them to re-organize the waste mixes to suit the new disposal mode i.e. co-incineration in cement industries. These practices, brought in new challenges in terms of workers health, compatibility of wastes, multiple middle level players, unauthorized intermixing of different industry wastes by transporters to suit acceptance criteria by co-incineration facilities. compliance by co incineration facilities, lack of minimum assured quantity to run common incineration facilities on continuous basis for some period thus forcing frequent shutdowns and prolonged storage of incinerable wastes etc.

There is a need to check the quality of the wastes reaching the co-incineration facilities, as it has been observed in many pharmaceutical industries that the hazardous wastes are getting mixed i.e. distillation residues, MEE rejects and the spent carbon and are sent for co-incineration. Therefore, chlorinated organics are also reaching the co-incineration facilities, where no specific flue gas treatment is provided.

Hence, it is observed that there is a need for policy intervention in respect of:

1. On-line tracking of the hazardous waste movement in the state
2. Promoting awareness, guidance programmes coupled with increased monitoring of compatible quality of waste for various ultimate disposal sinks
3. Ensuring that no unauthorized dealers in the network of hazardous waste movement including used oil/waste oil traders.
Geo-graphical distribution of existing common incineration facilities into respective states is a constraint, as the waste generated in the farthest point need to come up to Visakhapatnam for disposal. While the co-incineration facilities are offering some relief in terms of cost, their suitability for the type of mixed waste that are being burnt is a greater concern. Therefore, either a full-equipped co-incineration facilities or common incineration facility is required to shed the costs of transportation in Southern Andhra Pradesh. Besides, ensuring the minimum feed to these common incineration facilities is also a requirement, which has to be ensured by the regulatory authorities by establishing a level playing ground in respect of costs, to avoid unauthorized mixing of wastes and burning.

Specific observations regarding Telangana area are discussed below:

**Telangana (10 Districts):**

State generates a total of 75634 TPA of incinerable waste. There are 45 cement industries excluding grinding units, whereas only 3 (Anjani, My home, & NCL) were reported to have received hazardous waste during 2012-13. Details are as follows:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Industry</th>
<th>Quantity, TPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anjani Cement</td>
<td>6326.6 (Solid waste) + 5152.441 (liquid waste)</td>
</tr>
<tr>
<td>2</td>
<td>My Home Industry</td>
<td>4498</td>
</tr>
<tr>
<td>3</td>
<td>NCL + Others</td>
<td>17389.78</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>33366.79</strong></td>
</tr>
</tbody>
</table>

Dundigal TSDF having common incineration facility received a total quantity of 6727.242 TPA from Telangana 10 districts. As per the data available with SPCBs, the total incinerable waste reported to have received by cement industries all together for co-incineration, excluding Tadipatri facility in AP, is 33366.79 MT (i.e. in Telangana State).

Therefore, remaining incinerable waste (75633.99-6727.242-33366.79 = 35539.958 MT) must have been dealt by the individual industries in their incineration facilities.

Dundigal TSDF was earlier serving 18 districts, whereas after the bifurcation, the jurisdiction may be restricted to 10 districts of Telangana, unless there is an agreement for interstate transportation of Hazardous wastes. This development reduces the influx of incinerable waste to TSDF facility, which further reduces the capacity utilization of already less utilized common incineration facility.
Therefore, as stated in case of Andhra Pradesh, CED-GreenOrigin’s Team is of the view that a Technical Committee may be formulated to look in to the adequacy of facilities at co-incineration facilities, manifestation systems, pricing mechanism, avoiding middle men in the system without proper authorisation of the Board, application of regional criteria to ensure sustenance of the identified/authorized disposal facilities.

### 7.2.5 Land-fillable waste management through common Treatment, Storage and Disposal Facilities

TSDFs at Dundigal and Parawada are accepting landfill able hazardous waste from the industries, which are checked for suitability of direct land filling, if not stabilized before disposal. Adequacy of stabilisation and disposal are of both facilities are discussed in Study Visit Reports given in Appendix III

As mentioned previously, Dundigal facility is serving 18 districts due to geographical proximity and Visakhapatnam facility serving 5 coastal districts.

Land-fillable waste generation in districts and location & serving areas of TSDFs are shown in Figure 7-3. After bifurcation of State, the incinerable waste generation from two regions is demarcated in Figure 7-4.
Figure 7-3: District-wise Land-fillable Waste Reaching TSDFs at Dundigal and Parawada
Figure 7-4: Land-fillable Waste Generation from AP and Telangana Areas
Telangana specific details are discussed below:

**Telangana:**

State generates a total of 225877.78 TPA of land-fillable waste. Whereas, it was reported that only 99,278.118 TPA from 10 districts of Telangana received at Dundigal TSDF. It means most of the land-fillable waste is not reaching to the TSDF. This can be attributed to following:

1. The industries are not clearing the generated waste immediately; instead, the same is accumulating within their premises. Therefore, the generation and disposal are hugely differing. This clearance of HW from the industries within the statutory periods is an enforcement issue.

2. It is observed that most of the waste is mixed within the industries to make it transportable up to co-incineration facilities. For this mixing, often the waste i.e dried salts, FE salts, etc. which otherwise are suitable for land filling, are now rerouted to co-incineration facilities. This shift is changing the dynamics of the HW flows in the State. CED-GreenOrigin is of the View that the mixing taking place in some of the bulk drug industries is attached with high degree of safety and risk concerns.

3. It is evident that price difference in mode of disposal i.e. Co-incineration and TSDFs is the principle reason driving the industries to adopt mixing of wastes etc. for cost-effectiveness, while it is attached with safety and risk considerations.

4. Therefore, as suggested earlier a Committee should be constituted to set the pricing mechanism to streamline the waste management in the State.

5. TSDF in Dundigal was earlier serving 18 districts i.e. other than 5 coastal districts - Srikakulam, Vizianagaram, Visakhapatnam, West Godavari and east Godavari. Whereas, due to state bifurcation, now the same facility is to serve only 10 districts in Telangana. Therefore, correspondingly the influx of HW will reduce at Dundigal TSDF.
### 7.2.6 Used oil/ waste oil reprocessing facilities

**Telangana:**

State generates a total of 20913.917 MT of used oil/waste oil. There are 7 registered used oil/waste oil processing industries having a total capacity of 88536 TPA. Means, Telangana state is having 67623 MT of excess capacity. As such, M/s. Supreme Lubricants, Medchal, RR District, was visited by CED-GreenOrigin’s Team and observed that the capacity utilization is less than 2.5%.

It is important to note that because of permitting such a huge recycling capacity plants, the capacity utilization rates are very low, challenging the survival of these facilities with pollution control measures.

Workshops and garages are the principle source of used/waste oil generation, where as these facilities are now not covered under the authorisation scheme of the Pollution Control Boards. As such, it is given to understand that fixing unauthorized oil dealers who are reportedly adulterate the virgin lube oil etc. would increase influx of used/waste oil for processing.

This gap may be addressed, as it is not only affecting the authorized recyclers, but also plants and machinery besides air pollution.

### 7.2.7 Specific observations

1. Tank bottom sludge is not being reflected in the inventories; as the industries are cleaning the tanks with varying time periods say, once in 6-10 years, therefore, it is not a yearly phenomenon. As and when the tanks are cleaned-up, requires reporting, for ex. HPCL Visakhapatnam is holding 6000 KL for a long period, without information to the Board.

   Whereas, whenever, they empty the tanks, the bottom sludge quantity is substantial higher for recovery followed by proper disposal. Please note that the recycling facilities are equipped for used/waste oil only but not for oily sludges. This clarification shall trickle to all the regulatory officers, so that the industries do take the approach that is appropriate.

2. Lead acid batteries are almost used by the industries and at the end of used life, are disposed to the recyclers following the Battery Rules. Therefore, some industries reported quantity and some reported in numbers. As the conversion of quantity into nos. is not possible, we retained the figures as reported. As such,
CED-GreenOrigin is of the view, that the industries are sending the used batteries for recycling, as per the Battery Rules and therefore are not coming to TSDFs.

3. It has been observed that the used drums contaminated with various Chemicals are not cleaned properly by the industries. It is an imperative requirement to ensure proper cleaning of the drums before they leave the premises of the industries. In absence, these drums are used for several purposes, not necessarily for the same chemical carrying purposes, posing health risk to the end users. Ignorance of the public to the contaminants in these drums are often reflecting to fatal incidents, hence is a gap in the system, requiring intervention by the regulatory Board.

4. CED-GreenOrigin is of the view that following are to be enforced:

   ▪ Industry shall clean the drums and ensure that these are free from all the reminiscences of the chemicals, before sending them out of their premises.
   ▪ If not, shall be sent to an authorized cleaners (as of now, no authorized cleaner is reported) only.
   ▪ SPCB shall authorize the drums cleaning and resale dealers

5. CED-GreenOrigin made untiring efforts in compiling data from multiple sources and application of QA/QC checks, such a rigorous exercises can be streamlined by ensuring proper documentation from the industries and by maintain proper records with the Board – preferably soft data with inbuilt crosschecks.

6. To achieve point no. 5 above, there is a definite need for enhancing awareness upon starting from what is hazardous waste? till the integrity analysis of dumpsites, through a competent professionals such as CED-GreenOrigin.

7. It is also observed that the most of the industries visited are operating based on deemed consent. It shows that the decision regarding permission or rejection could not be taken timely, perhaps because of the complex reactions, time that takes in reviewing and required professional experience. CED-GreenOrigin Team is of the view that a technical sound Team / firm shall be engaged to review on behalf of the Board for facilitating the decision-making besides a Technical Committee specifically for chemical industries. Please note that deemed consent in respect of synthetic organic chemicals means, any reaction can be performed at any time in any quantity that the industry considers fit without concurrence of the Board on preparedness incase of routine and emergencies – which is a significant concern.
8. Proper stacking, identification, demarking, conspicuous identification and space for inspection are found a significant issue in all the chemical industries, requiring immediate consideration.

9. HW storage sheds, prone for fire safety, will have to have flameproof fittings.

10. The CED-GreenOrigin’s Team is concerned about health of the workers handling hazardous waste, particularly those who are mixing different wastes to for disposal to co-incineration facilities.

11. The concept of zero discharge is converting entire solids in wastewater into a solid/hazardous waste. So the net quantity of hazardous waste generation is increasing, whereas, the generated waste instead of reaching its designated land-fills for disposal, getting mixed with organic residues and spent carbon etc. to form a mix suitable for co-incineration, as a result, posing additional risk in its entire life cycle (safety, health of workers, air pollution due to VOCs, transportation risk, handling of this complex waste in cement plants, inadequate flue gas treatment in cement industries etc.).

12. Housekeeping specifically in and around storage and ETP areas requires improvement across the industries.

7.3 Way Forward

1. A focused programme may be taken-up for atleast 25 major hazardous waste generating industries in each district through Regional Offices. Please refer Appendix VIII & Appendix IX for AP and Telangana respectively, to start with for the list of industries, which may be yearly/regularly revised based on the measures taken by the industries and change in production patterns. A voluntary agreement in the lines of Corporate Responsibility for Environment Protection (CREP) may be explored with these industries for ensuring the better management of the hazardous waste.

2. Those industries, which does not store their waste properly as per the best practices and authorization conditions shall be imposed with bank guarantees and fined suitably, in order to generate fund for cleanup of orphan contaminated sites.

3. While the industries recycle waste to certain percentage, maximization of the same is constrained in the same industry due to quality/yield concerns. Therefore, the statistics shows that
there is huge quantity, which has characteristics to get recycled, but the location specific demand for such waste may not be available, making the by-product a qualified hazardous waste needing secured disposal.

4. AP and Telangana SPCBs may establish independent Centre, financially supported by SPCBs for promotion of cleaner technologies, cleaner production, waste minimisation, waste exchange forums etc. to achieve ultimate objective of eco-industrial development. This Center may join hands with industry associations to assume lead role in organizing trainings, workshops, awareness programmes, environmental/process/energy audits, brings out specific issues for policy interventions etc.

5. Leading industry associations in the States may be asked to maintain waste information exchange centers to reduce the end HW that requires safe disposal.

6. Operation of a dedicated common incineration facility with full-fledged tail gas treatment demands certain assured quantity of incinerable hazardous waste. Study findings are of any indication; existing common incineration facilities s (one in each state) are not in operation for most of the time on the premise of decimal influx of incinerable waste. Minimum sustaining capacity for a common incineration facility having rotary kiln is about 1 t/hr feeding capacity. If such feeding is not ensured, the plant requires frequent shutdowns and each recommencement of facility adds cost. Many varieties of wastes can go for co-incineration at cement industries, without violation of flue gas quality requirements. However, not all the wastes can be sent for co-incineration. Currently the co-incineration facilities are accepting waste, but the infrastructure facilities and handling procedures in particular for solid form of hazardous waste requires substantial measures, at par with TSDF.

7. Significant changes have taken place in the state due to the introduction of zero discharge concept and co-incineration facilities. Zero discharge concept facilitates streamlining of CETPs, ended up in generation of higher quantity of hazardous waste in the form of salt, more energy consumption, significant VOCs stripping in plant premises, less regard to biological treatment units as largely depended on MEEs and ATFDs etc. that do generate condensate, which requires biological treatment for BOD & COD reduction. Co-incineration facilities offered a significant financial relief to industry, as a result forced them to re-organize the waste mixes to suit the new disposal mode. These practices,
brought in new challenges in terms of workers health, compatibility of wastes, multiple middle level players, unauthorized intermixing of different industry wastes by transporters to suit acceptance criteria by co-incineration facilities. compliance by co incineration facilities, lack of minimum assured quantity to run common incineration facilities on continuous basis for some period, thus forcing frequent shutdowns and prolonged storage of incinerable wastes etc.

8. Due to bifurcation of State, there is a change in serving area and corresponding capacity requirements to handle the hazardous waste. As such, there is a cost factor on the account of transportation of hazardous waste, particularly from southern AP to existing facility in Visakhapatnam. Therefore, need arises to have an arrangement to serve southern AP industries in the form of additional TSDF with viable capacity, say minimum of 25000 tonnes/year) or alternate pricing mechanism to encourage compliance.

9. In case of used/waste oil management in the State, authorized processing capacity and generation in AP are compatible; the authorized processing capacities in Telangana are very high in comparison to generation figures. Therefore, there is a race for bottom in pricing of used/waste oil, compromising on pollution control measures. As such, the facility visited by CED-GreenOrigin’s Team reported less than 3% of authorized capacity utilization. A huge quantity of used/waste oil from servicing stations is not reaching the recyclers. Therefore, there is a need for collection centers, which may be authorized by SPCBs.

10. Specific observations listed in Inferences Section require specific interventions.

11. A Technical Committee may be formulated by both the State Boards, to device policy interventions in respect of findings of the inventorisation studies.
8.0 DISCLAIMER

1. This document has been prepared by CED-GreenOrigin solely for the use and benefit of APPCB. Any use of this document or the information contained herein by persons or entities other than APPCB, without the express written consent of CED-GreenOrigin represented by the GreenOrigin, shall be at the sole risk and liability of said person or entity, and CED-GreenOrigin shall not be liable for any damages resulting therefrom.

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3. This Report is based on available information and understanding as in June 2013. Past status was considered on the basis of discussions and readily available records, interviews, and recollections of information provided to CED-GreenOrigin, or reasonably available to CED-GreenOrigin.

4. Available records, interviews, and recollections of information provided to CED-GreenOrigin.

5. The inferences submitted in this report are based partly upon the data obtained from a limited number of sources. The status and variations may not become evident until further studies/investigations are accomplished. If variations or other latest conditions then appear evident, it will be necessary to reevaluate the inferences drawn in this report.

6. If SPCBs desires to take legal actions based on the information contained in this Report, the present position must be ascertained by SPCB at the time of taking such legal action.

7. CED-GreenOrigin shall not be made liable/respondent for any legal matter, by any one, based on the information contained in this Report.

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and Waste reduction options in Dyes & Dye Intermediate Sector
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