Project Dissertation Report on

The study of the Behavior, Perception & Knowledge of the Factories based in Delhi towards the Hazardous Waste Management

Submitted By

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CERTIFICATE

This is to certify that the dissertation report titled The study of the Behavior, Perception & Knowledge of the Factories based in Delhi towards the Hazardous Waste management is a bonafide work carried out by Mr. Nitesh Kumar of EMBA 2020-22 and submitted to Delhi School of Management, Delhi Technological University, Bawana Road, Delhi-42 in partial fulfillment of the requirement for the award of the Degree of Masters of Business Administration (Executive).

Signature of Guide

Signature of Head (DSM)

Seal of Head

Place: New Delhi

Date: 04-05-2022

DECLARATION

I, Nitesh Kumar, student of EMBA 2020-22 of Delhi School of Management, Delhi Technological University, Bawana Road, Delhi – 42, hereby declare that the dissertation report on The study of the Behavior, Perception & Knowledge of the Factories based in Delhi towards the Hazardous Waste management submitted in partial fulfillment of Degree of Masters of Business Administration (Executive) is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge.

This report is not being submitted to any other University, for award of any other Degree, Diploma or Fellowship.

Date: 04-05-2022

Place: New Delhi

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Summary

In recent years, Delhi has experienced remarkable economic expansion. Several environmental concerns have evolved as a result of fast industrial and urban expansion. Despite having a thorough statutory and lawful framework for environmental safeguard, Delhi lacks a proper hazardous waste treatment, storage, and disposal facility for the proper disposal of hazardous wastes generated from various types of factory units and wastewater Treatment Plants operating in various areas specially designated for the factories of Delhi along with the hazardous waste generated from households waste thriving in Delhi.

On 28th.07.1989, MoEFCC had announced the Hazardous Waste Rules under the provisions of the E.P Act, 1986, which were later revised in 2000 and 2003. Hazardous Waste (Management, Handling, and Transboundary Movement) Rules, 2008 and Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016 were adopted in response to the need for effective management of hazardous waste (HW), primarily solids, semi-solids, and other industrial wastes, which not only fall under the jurisdiction of the Water (Prevention and Control of Pollution) Act and the Air (Prevention and Control of Pollution) Act, but also allow the authorities to implement.

Hazardous waste generated by Factories is one of today's fastest rising wastes. The volume of hazardous waste is growing as industrial productivity rises.

We have different norms, guidelines, and SoPs in India to monitor these hazardous wastes on a regular basis in order to have these wastes managed and disposed of in a scientific manner in a TSDF. The accumulation of this hazardous waste in an unsupervised way will severely harm both human health and the environment. More of these wastes are mostly managed in the informal sector in an unscientific manner that hurts the environment and lives. To address this, more proactive actions, such as proper transportation and disposal of hazardous waste in TSDF, as well as environmental awareness, must be taken by the government, non-governmental organisations (NGOs), TSDF, and individuals who are directly or indirectly involved with this type of waste.

This paper seeks to examine how Delhi-based Factories perceive hazardous waste disposal mechanisms and environmental upkeep, as well as related hazards and behaviour. The study investigates the behaviors, perceptions, and knowledge of Delhi-based Factories about hazardous waste management. A structured questionnaire survey involving Delhi-based Factories has been used as a approach.

To properly develop the survey questions, it is vital to learn about the perception, knowledge, and behaviour of Delhi-based Factories about hazardous waste management. These questions are related to the attributes listed below. (1) Hazardous Waste Perception, Behavior, and Knowledge, (2) Economic Benefit, (3) Knowledge, and (4) Industry Willingness The survey was completed by 38 participants from various Factories in Delhi, 31 of them are men and 7 of whom are women. The majority of the participants are between the ages of 30 and 50. The majority of them have a graduate or postgraduate degree. On the basis of the survey results, inferences, suggestions, conclusions, and recommendations have been made that may assist stakeholders in managing hazardous waste in accordance with the regulations and standards.

Key Words: Hazardous Waste, Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016, Guidelines & SoP’s for Hazardous Waste.

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1. Introduction

On 28th.07.1989, MoEFCC had announced the Hazardous Waste Rules under the provisions of the E.P Act, 1986, which were later revised in 2000 and 2003. Hazardous Waste (Management, Handling, and Transboundary Movement) Rules, 2008 and Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016 were adopted in response to the need for effective management of hazardous waste (HW), primarily solids, semi-solids, and other industrial wastes, which not only fall under the jurisdiction of the Water (Prevention and Control of Pollution) Act and the Air (Prevention and Control of Pollution) Act, but also allow the authorities to implement.

In today's world, hazardous waste generated by Factories is one of the fastest rising wastes. As industry productivity rises, the volume of hazardous waste produced rises with it.

We have different laws, standards, and standard operating procedures in India to monitor these hazardous wastes on a regular basis so that they may be treated and disposed of in a scientific manner in a TSDF. The accumulation of this toxic waste in an uncontrolled way would severely harm human health and the environment. More of these wastes are primarily managed in the informal sector in an unscientific manner in the open, endangering the environment and human lives. To solve this, we need more proactive activities, such as appropriate transportation and disposal of hazardous waste in TSDF, as well as increased knowledge from the government, non-governmental organisations, TSDF, and those who are directly or indirectly involved with various types of hazardous waste.

It is critical to understand about the perceptions, knowledge, and behaviour of Delhi-based Factories about hazardous waste management in order to correctly construct survey questions. These inquiries pertain to the qualities stated below. (2) Economic Benefit, (3) Knowledge, and (4) Industry Willingness The survey was completed by 38 people from various Delhi businesses, 31 of whom were males and 7 of whom were women. The participants are mostly between the ages of 30 and 50. They hold a graduate or postgraduate degree in the majority of cases.

Inferences, ideas, findings, and recommendations have been made based on the survey results that may aid stakeholders in handling hazardous waste in line with legislation and standards.

1.1 Background

In recent years, Delhi has experienced remarkable economic expansion. Several environmental concerns have evolved as a result of fast industrial and urban expansion. Despite having a thorough statutory and lawful framework for environmental safeguard, Delhi lacks a proper hazardous waste treatment, storage, and disposal facility for the proper disposal of hazardous wastes generated from various types of factory units and wastewater Treatment Plants operating in various areas specially designated for the factories of Delhi along with the hazardous waste generated from households waste thriving in Delhi.

Under the terms of the E.P Act, 1986, MoEF&CC had notified the Hazardous Waste Rules, 1989. After changes to prior rules for effective management of Hazardous waste, the Hazardous waste management, 2016 were enacted. These law provisions establish the legal framework within which actions must be done to ensure that hazardous waste is stored, transported, treated, and disposed of in an environmentally sound manner.

RESPONSIBILITY OF STATE GOVERNMENT

Rule 16 (1) of Chapter IV of the Hazardous Waste Management Rules, 2016, titled as Treatment, Storage and Disposal Facility (TSDF) for Hazardous and Other Wastes says:

"… The State Government, Occupier, Operator of a facility or any association of occupiers shall individually or jointly or severally be responsible for identification of sites for establishing the facility of treatment, Storage and disposal of the hazardous and other waste in the state …"

Accordingly it mandates the role and the responsibility of the Govt. of NCT of Delhi along with Industrial association/CETP (Wastewater Treatment Plant) societies and hazardous waste generators in establishing an appropriate facility for treatment of hazardous waste.

ORDER OF THE HON'BLE NGT

Further, while hearing the case of "Balam Singh Rawat V/s Govt. of National Capital Territory of Delhi and Ors".Hon'ble National Green Tribunal (NGT) has passed following orders on 30.03.2015:

"The Commissioner, North Delhi Municipal Corporation is present and he submits that in the meeting it has been finalized and this Corporation is prepared to hand over 14 acre of land for dealing with the Hazardous Waste in Bawana, NCT, Delhi. However, the project is to be developed by the DSIIDC in collaboration with the DPCC".

APPROVAL OF CABINET

The Delhi Cabinet has accepted the proposal to establish a Hazardous waste Treatment, Storage, and Disposal Facility (TSDF) at Bawana, Delhi, via decision no 2583 dated 21.06.2018, as conveyed by Commissioner (CETP) via letter no F-12/484/Env/Appeal-305/2013/241 dated 07.08.2018, accompanied with Cabinet Note.

URGENCY FOR SETTING UP OF TSDF

As previously stated, this work was undertaken in accordance with the direction of the Hon'ble NGT in the matter of Balamsingh Rawat vs. Govt. of NCT of Delhi &Ors., and DSIIDC filed an affidavit before the Hon'ble NGT in July 2015, stating that the work of the TSDF would be completed within two years. Furthermore, in another case, M/s Rajiv Naryana & Anr. vs. Union

of India & Ors., the Hon'ble NGT ordered on July 30, 2018, that a TSDF be established in Delhi within three months.

As the establishment of a TSDF in Delhi is urgently required, not only to comply with Hon'ble NGT orders, but also because a large quantity of hazardous waste is stored in the factories and wastewater treatment plant, and they are struggling to facilitate more hazardous waste due to a lack of space in their premises.

Hazardous Waste Detail

There are around 1123 operational factories in Delhi that are anticipated to produce hazardous waste during everyday operations. These process units are already storing hazardous waste in their facility or at wastewater treatment sites. Moreover, roughly 21,000 MT of hazardous waste/sludge are held at several wastewater treatment plant in Delhi. The total hazardous wastes produced in and around Delhi is around 4197.76 TPA, with nearly 2318 TPA generated by 1123 no. of factories and the remaining 1880 TPA generated by 13 wastewater treatment plant located in the Delhi location. Moreover, about 20466 MT of hazardous waste stocks is accumulated in 13 wastewater plants. (Data source, DSIIDC RFP,2018)

Data are follows:

A. Stock Piled Hazardous Waste up to July 2016
    1. Wastewater Treatment Plant = 25,000 MT
    2. Factories = 20,000 MT

       Total = 45,000 MT
B. Hazardous Waste generated in 4.5 years (Aug 2016 to Jan 2021) considering generation @ 4200 MT/A = 18,900 MT

C. Total Hazardous Waste till Jan, 2021 (A+B) Approx. = 63,000 MT

1.2 Problem Statement

1. An increasing population, industry, and economy, resulting in increased hazardous waste quantities and domestic hazardous waste generation.
2. The enhanced complication of the many of the types of hazardous waste of different units of factories based in Delhi because of urbanisation and industrialisation. The complexity of the waste stream has a direct impact on the complexity of its management, which is exacerbated when hazardous waste gets mixed with municipal waste.
3. A historical stockpile of hazardous waste lying in the Factories and CETPs of Delhi are matter of concern. Inadequate hazardous waste and domestic hazardous waste disposal results in uncomfortable living circumstances as well as a dirty, unhealthy environment.
4. Limited understanding of hazardous and domestic hazardous waste flows and waste balance since waste data input is voluntary, and where the data is readily available, it is frequently incorrect & conflicting.
5. The statutory and lawful framework that readily promotes the management of hazardous waste hierarchy. This has hampered the waste management sector's economic potential. Both hazardous waste collection and the recycling business contribute significantly to job creation and GDP, and both may grow further.
6. The absence of a hazardous waste material recovery facility to extract recycling material infrastructure, which will allow hazardous waste and recyclables to be segregated at the source and industrial wastes routed to recycle and purchase back activities.
7. Increasing demand on hazardous waste management infrastructure, with diminishing levels of economic.
8. Hazardous waste management is widely underpriced, implying that consumers and businesses do not completely understand the costs of management of waste and disposal is preferred over other alternatives.

1.3 Objectives of the Study

In this report will study about the followings:

- Perception, Knowledge and Behavior towards the Hazardous Waste Management in the Delhi based Factories
- Literature review of the generation and disposal of the hazardous waste generating from the Factories based in Delhi
- Statistical analysis of the secondary data
- Data analysis of the primary data obtained from the survey from the Factories based in Delhi which will be quantitative in nature, relying on statistical tools and hypothesis testing.

1.4 Scope of the Study

- To understand the Perception, Knowledge and Behavior towards the Hazardous Waste Management in the Delhi based Factories
- Statistical analysis of the secondary data of the no. of Hazardous waste generating units and the quantum hazardous waste generation
- Identify any relevant consequences on the environment from hazardous waste production; and
- Analysis of data of primary data received from the survey of Delhi-based Factories, which will be quantitative in nature, depending on statistical methods and hypothesis testing.
- Advising on optimal waste management and disposal methods and routes in compliance with current administrative and statutory requirements

2. Literature Review

a. About Delhi

Delhi's National Capital Territory is 1483 sq. km. It has a maximum length of 51.9 km and a maximum width of 48.48 km. Rural areas cover 783 sq. km of the total 1483 sq. km, whereas urban areas cover 700 sq. km. The three statutory towns are the MCD (with an area of 1397.3 sq. km), the NDMC (42.7 sq. km), and the Delhi Cantonment Board (43 sq. Km). It is bounded on three sides by Haryana, and on the east by Uttar Pradesh across the Yamuna. The majority of the region is located on the Yamuna River's western bank, with only a few villages and Shahdara's urban center on the eastern side. The elevation of Delhi varies between 213 and 305 meters above the sea level.

Legal & Regulatory Review

The legislation requires the occupier, operator, and governing agencies to undertake specific tasks and obligations in order for the hazardous waste management facility to function properly. These standards are outlined in the Hazardous Trash Management Rules, 2016 and apply to waste generators as well as the possible operator of Delhi's proposed hazardous waste management facility. In addition to these laws, the Central Pollution Control Board has produced instructions on the framework for establishing waste management facilities, hazardous waste landfill criteria, waste dump liners and coverings, and so on. This section addresses the regulations and guidelines' relevance to the Hazardous Waste Management Facility.

Hazardous Waste (H&M) Rules, 2016

The regulations describe hazardous waste just like any waste that constitutes a concern to human health or the environment owing to its physical, chemical, reactivity, toxicity, flammability, explosiveness, or corrosive properties. The hazardous waste regulations apply to any industry that produces waste that can be classified as hazardous.

- Wastes containing materials listed in Schedule-2 if their concentration is equal to or more than the limit set in that schedule; or
- Wastes specified in Column (3) of Schedule-1 of the waste management regulations.

In Delhi, 1123 Factories were covered under this definition currently and the number is expected to remain constant or decrease in the coming years.

At the time of operation of the facility, the various stakeholders like the occupier or the waste generator, the association of waste generators, the potential operator of the facility and lastly the regulatory authorities have to perform certain roles and responsibilities to enable the proper functioning of the facility.

Roles and Responsibilities of the Waste Generator

According to the current state of compliance with the rules, the Delhi Pollution Control Committee is granting hazardous waste authorization to all generators who have been properly handling and storing wastes as directed by the DPCC, until the proposed common hazardous waste management facility is operational. Form –I, which is appended to the regulations, is used by generators to apply for waste permission. Once the facility is functioning, these generators must transfer their hazardous waste to the facility to guarantee appropriate treatment and disposal of hazardous waste, or their permits may be cancelled.

The generators are responsible for

- Hazardous waste container labelling in compliance with the terms of the Central Government's guidelines set under the Motor Vehicles Act, 1988. A universal label must be attached to all garbage containers. The label should be made of non-washable material with a neon yellow background and the phrases "HAZARDOUS WASTES" and "HANDLE WITH CARE" printed in red.
- Creating six copies of a manifest in Form 9 that includes information such as the occupier, transporter, and vehicle registration number, the type of vehicle transporting the hazardous waste, a description of the waste in terms of quantity and consistency, and the number and types of containers used to transport the waste. The transporter will sign all six copies for the occupant.
- The colour codes and the purposes of different copies would be as per the HWM Rules 2016

Responsibilities of the Operator

The facility's operator must apply to DPCC for authorization to collect, store, process, and dispose of hazardous wastes in Form-I. The DPCC will not provide the authorization unless DPCC is okay that the operator has technically adequate facility and experience, and machinery to adequately treat the waste. Within 90 days of receiving such application, DPCC will finish the processes for granting/cancelling the authorization.

The operator's responsibilities during facility operation include the following:

- Taking steps to contain contaminants while handling wastes and prevent accidents
- Providing information, training, and equipment to those working on the site to ensure their safety
- Taking steps to contain contaminants while handling wastes and prevent accidents
    - Obtain approval to operate under the Water and Air Act of 1974 and 1981 subequently.

- Authorisation for hazardous waste under the Hazardous waste (M&H) rules, 2016.
- Aside from these tasks, the operator and occupier must execute the following common functions, which are outlined below:

Other than these responsibilities, the operator and the occupier needs to perform certain common functions and are as discussed below:

Functions common to the occupier and the operator

The occupier / operator shall

- Keeping the records of operations such as trash collection, treatment, storage, and disposal on Form 3 appended to the rules. These records should include a detailed description of the quantity of trash reused / recycled, the volume and weight of wastes to be handled, their characteristics, as well as methods of waste storage, transportation, treatment, and disposal.
- Submit yearly reports to DPCC on hazardous waste handling. The forms must be filed by the 31st of January of each year and must include information such as the amount and types of waste generated, its physical and chemical properties, means of transportation to the waste disposal site, and details on waste treatment and disposal procedures.
- Immediately notify the DPCC of any accident that occurs during the handling or management of garbage in Form 5 appended to the rules.
- The occupant or operator may appeal to the Secretary, Department of Environment, State Government, against any order granting or refusing an authorization.
- The occupier and operator of the facility shall be held accountable for environmental harm caused by inappropriate handling and disposal of hazardous material. They shall also be responsible for reinstating or restoring damaged elements of the environment at his expense;

Functions of the Regulatory Authorities

The authorities that would be involved in regulating the management of Hazardous waste in DPCC, and the CPCB. The duties of each are as noted below

Duties of Delhi Pollution Control Committee (DPCC)

The DPCC would be in charge of issuing authorization and other legislative permits for the facility's development and operation. It is also in charge of renewing the authorizations of waste producers who are currently functioning under authorizations given under the HWMH Rules, 2008. When the facility becomes operational, all waste generators must become members of the facility; otherwise, the DPCC may revoke the authorizations. The SPCB must finish the process of granting/renewing authorizations within ninety days of receiving the application. DPCC may terminate an authorisation granted within the time of validity if it believes the authorised person has failed to comply with any of the permission directions.

Duties of Central Pollution Control Board (CPCB)

The CPCB is in charge of registering recyclers and refiners. As a result, any recyclers or re-refiners who are not registered with the CPCB or the MoEFCC must apply for registration with the CPCB using Form 11.

CPCB Guidelines

The following CPCB instructions are applicable to waste generators, operators, and regulatory bodies in order to assist the application of the Hazardous Waste Management Rules.

- Instructions for establishing an operating facility
- Hazardous waste landfills criteria

- Design, Construction, and Quality Control of Liners and Covers for Hazardous Waste Landfills- Manuals
- Manual on Characterization of Hazardous Waste, Analysis & Sampling
- Proper functioning and upkeep of disposal sites-Guidelines
- Coprocessing in the cement, power, and steel Factories-Guidelines
- Monitoring of CHWTSDF and Protocol performance evaluation

b. Factories in Delhi

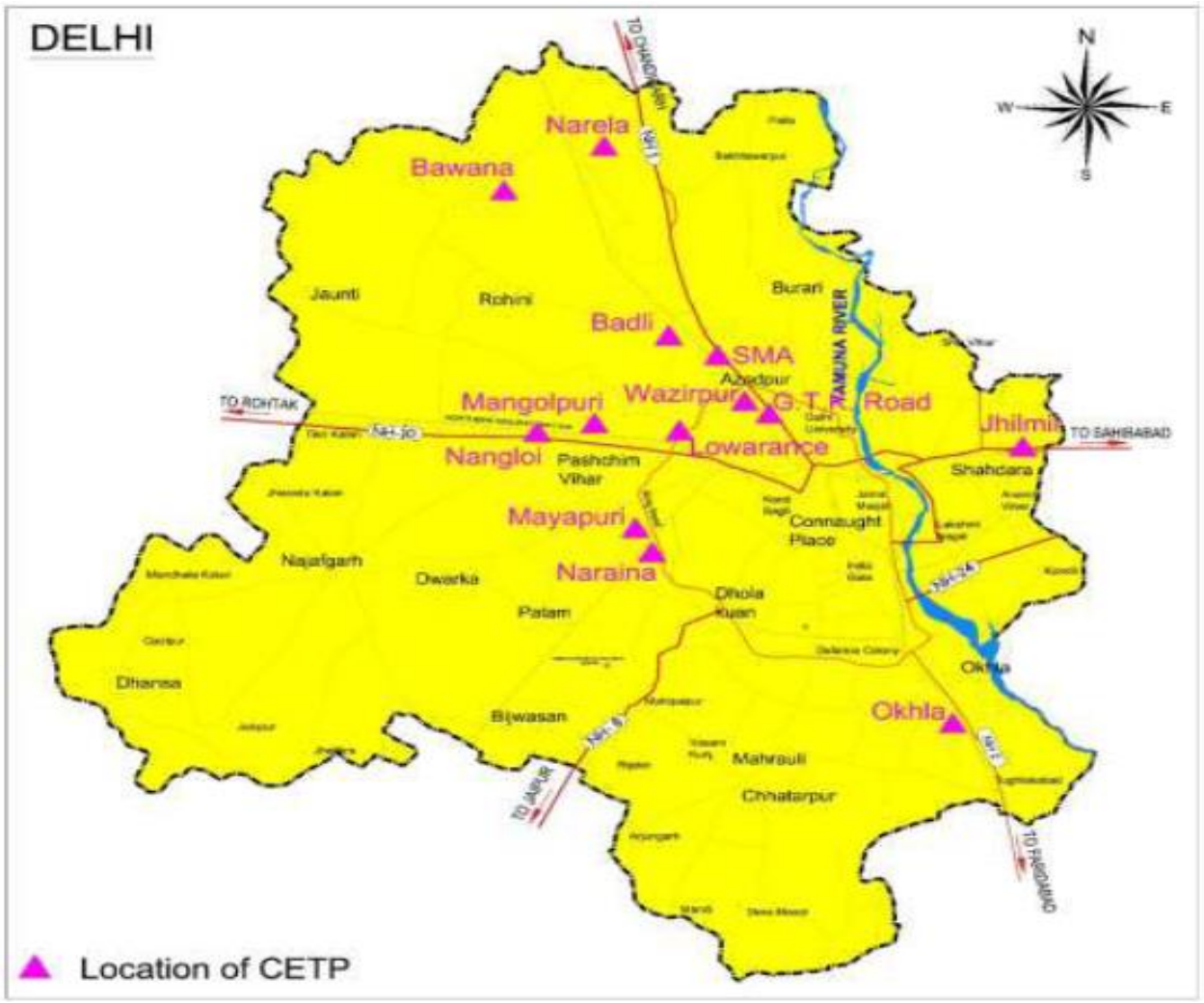
According to the Ministry of Micro, Small & Medium Enterprises, New Delhi's industrial profile of NCT Delhi, 2012-13, Delhi has a total of 32065 registered industrial units. Except for a few power plants such as Bawana Gas-based Power Plant there are no large-scale industrial enterprises in Delhi.

There are no registered medium-sized businesses in Delhi. The bulk of Factories in Delhi are small businesses, including electronic units, metal surface treatment, dyeing, medicines, printing, motor vehicle repair centres, & textiles.

These small size industrial facilities are the primary source of hazardous garbage in Delhi. These small size enterprises are located in 29 different industrial clusters throughout eleven districts in Delhi, divided into four zones: north, south, east, and west. The North zone has the most industrial zones, followed by the South, West, and East zones.

Source: Delhi State Industrial and Infrastructure Development Corporation Ltd. (DSIIDC), http://www.dsiidc.org/

In addition to the hazardous waste created by industrial units, the sludge from the Common Effluent Treatment Plant (CETP) that treats industrial waste water is also toxic. Wazirpur, Mangolpuri, Mayapuri, G.T.K, Badli, S.M.A, Okhla Indl. Area, Jhilmil, Nangloi, Lawrence Road, Naraina, Bawana, and Narela are among the 13 CETPS in Delhi. Except for the CETPs at Lawrence Road, Bawana, and Narela, which are run by DSIIDC, the CETPs are run by their individual CETP organisations.



Source: Delhi State Industrial and Infrastructure Development Corporation Ltd. (DSIIDC), http://www.dsiidc.org/

c. Hazardous Waste Generating Unit in Delhi

The information on hazardous waste generating plants was gathered from the Delhi Pollution Control Committee (DPCC) and given by the DSIIDC. The information given by DPCC was collected from the Factories' Hazardous Waste Authorization form. Under the Hazardous Waste Management Rules, enterprises must get DPCC authorization for hazardous waste collection, treatment, storage, and disposal. The renewal of authorization is required every five years, and the DPCC grants authorization on the condition that the act's terms have not been violated. Given that all industrial units now operating in Delhi that produce hazardous waste must have submitted documentation for authorization within the previous five years.

Data from the Hazardous Waste Authorisation form submitted to the DPCC from 2011 to 2016 were used to analyse hazardous waste producing units and hazardous waste generation in Delhi.

This data on hazardous waste producing units and trash generation differs somewhat from the data supplied in the DPCC's 2007 inventorisation report. The table below details the various industrial zones in Delhi, as well as the number of units creating hazardous waste in each industrial sector.

District	S. No	Industrial Area	No of units generating Hazardous Waste as per DPCC 2007 Inventorization	No of units generating Hazardous Waste as per the 2016 data
East Delhi	1	Non Industrial Area		4
	2	Anand Parbat	124	19
	3	Kirti Nagar	56	28
	4	Najafgarh Road	80	56
	5	Nangloi	17	11

	6	Naraina Phase - II	108	35
	7	Tilak Nagar	3	5
	8	Udyog Nagar	17	20
West Delhi	9	Keshopur	-	1
	10	Moti Nagar DLF	-	9
		Non Industrial Area	-	39
	11	Badli	66	28
	12	Bawana	2	47
	13	G.T. Karnal Road	66	36
	14	Narela	67	32
	15	Rajasthan Udyog Nagar	13	9
	16	S.M.A	32	13
North Delhi	17	S.S.I	29	7
	18	Mohan Co-operative	-	6
		Non Industrial Area	-	7
North East	19	Shahdara (North of GT Road)	-	12
		Non Industrial Area	-	5
	20	Lawrence Road	26	9
North West	21	Mangolpuri	25	14
	22	Samaipur	51	2
	23	Wazirpur	203	40
		Non Industrial Area		17
	24	Mayapuri	213	111

New Delhi	25	Naraina Phase - I	89	48
		Non Industrial Area	-	18
South	26	Non Industrial Area	-	17
South West	27	Non Industrial Area	-	22
	28	Mohan Co-operative	11	13
	29	Okhla	231	154
	30	Okhla Flatted Factory Complex	-	6
South East	31	Okhla Industrial Estate	-	5
	32	Non Industrial Area	-	0
	33	Jhandewalan Falatted Factory Complex	-	1
	34	Shahzada Bagh	34	18
Central		Non Industrial Area	-	12
	35	Friends Colony	130	73
	36	Jhilmil	90	41
Shahdara	37	Patparganj	73	67
		Non Industrial Area	-	6
		Others	139	
		Total	1995	1123

Source:
1) Report on Inventory of Hazardous Waste Generating Industrial Units in Delhi, DPCC, 2007
2) Data provided is based on Hazardous waste Authorisation form submitted by Factories to DPCC (2011- 2016) Jan)

Above data indicates that there has been decrease in the number of hazardous waste generating unit in Delhi from the year 2007 to current year. The number of Factories generating hazardous waste has reduced from 1995 in year 2007 to 1123 in the year 2016. Decrease in industrial activity is attributed to following reasons:

- Few Factories in Delhi have closed due to stringent pollution control regulations
- High manufacturing cost also compelled industrial units to close or relocate from Delhi
- Some industrial units relocated from Delhi because of good incentive for industrial development provided by states like Himachal Pradesh, Uttarakhand and Jammu & Kashmir
- In the above table pickling units is excluded as these unit in Delhi will be closed by September 2016

As per the new data provided by DPCC, total 1123 industrial units located in different industrial areas of Delhi have been identified for generating hazardous waste. Maximum number of factories generating hazardous waste are located in Okhla followed by Mayapuri and Wazirpur.

In addition to the above, there are 13 CETPs to treat industrial effluents in Delhi, which are operating under as per the clauses stipulated under CETP Act, 2000 and CETP Rules, 2001. The sludge generated from treatment of waste water in CETP is hazardous in nature as per the HWM 2008 Rules. The details of the CETPs including designed capacity and type of treatment provided is shown in Table

S. No.	Name of wastewater treatment plant (CETP)	Capacity in (MLD)	S. No.	Industrial Area	Type of Treatment System
1	Okhla	24	1	Okhla, Ph-I & II	A
2	Naraina	21.6	2	Naraina Ph-I & II	A

3	Mayapuri	12	3	Mayapuri Ph-I & II	A
4	Badli	12	4	Badli	A
5	Bawana	35	5	Bawana	B+A
6	GTK	6	6	GTK Road	A
7	Lawrence Road	12	7	Lawrence Road	A
8	Mangolpuri	2.4	8	Mangolpuri Phase- I&II	B
9	Narela	22.5	9	Narela	B
			10	SMA	
10	SMA	12	11	SSI	A
			12	Rajasthan Udyog Nagar	
11	Wazirpur	24	13	Wazirpur	A
12	Nangloi	12	14	Nangloi	A
			15	Udyog Nagar	
				Jhilmil	
13	Jhilmil	16.8	16		A
			17	Friends Colony Ind. Area	
	Total	212.3		Source: Delhi Pollution Control Committee A: Physio-Chemical treatment and filtration B: Plain setting plus aerobic biological treatment and filtration	

Source: CETP, Department of Industries, Government of National Capital Territory of Delhi, Retrieved from: http://www.industries.delhigovt.nic.in/common-effluent-treatment-plants-societies

Most of the CETP have Physico Chemical Treatment Process; except for Narela and Mangolpuri CETP which follow Bio-logical treatment process.

d. Generation of Hazardous Waste

Hazardous Waste from Factories

Data for hazardous waste generation has been derived from the data provided by DPCC from Hazardous waste authorisation form submitted to DPCC by various Factories from year 2011 to Jan 2016.

Some of the hazardous waste generation numbers obtained from DPCC data were verified during the site visit and corrected based on the discussion with industry owners. However, the verification of entire data has not been done as part of this assignment. Certain anomalities were identified during review of data and sample field investigation.

Data obtained from Hazardous waste authorisation forms submitted to DPCC by various industrial units in Delhi. DPCC indicated that the total Hazardous Waste (HW) generation data presented in the interim report for industrial units (derived based on DPCC data) seems on the higher side than actual HW generation in Delhi. This may be on account of wrong information furnished by some of the industrial units to DPCC.

Following approach was finalised for calculation of quantum of Hazardous Waste generated from industrial units in Delhi:

1. Sample discussion with Industrial Units and their Consultants
2. Review of HW data from 2007 report of DPCC
3. Extrapolate the number based on average quantum obtained from similar operating industry in Delhi
4. Exclude the quantum of HW generated from pickling Factories as these units will be closed by September 2016 (approximately 469 TPA)

Based on the above approach, total quantum of hazardous waste generated in Delhi is around 2318 TPA excluding HW generated from CETP.

As per the data, the Factories located in the Industrial area of Moti Nagar DLF, , Okhla, Mayapuri, Wazirpur & Mohan cooperative are generating the maximum hazardous waste in

Delhi. Location wise details on the type of Factories and quantity of Hazardous waste generation per annum in different industrial area is provided in

Table Location wise Hazardous Waste Generation

S. No.	Industrial Area	Type of Factories	Hazardous waste (TPA)
1	Non Industrial Area	Automobile Servicing	35.65
2	Anand Parbat Industrial Area	Printing, Metal Finishing, Electroplating	19.55
3	Kirti Nagar Industrial Area	Printing, Wire Drawing, Automobile Servicing, Manufacturing & Engineering works	24.578
4	Najafgarh Road Industrial Area	Printing, Automobile Servicing, Manufacturing & Engineering works	110.3
5	Nangloi Industrial Area	Printing, Manufacturing of Plastic & Engineering works	31.395
6	Naraina Industrial Area Phase - II	Printing, Manufacturing o Electrical parts & Engineering works	27.9
7	Tilak Nagar Industrial Area	Printing & Automobile Servicing	9.2
8	Udyog Nagar Industrial area	Printing, Automobile Servicing, Manufacturing of Auto parts & plastic items	61.345
9	Keshopur Industrial Area	Bike Repair (Without Washing)	2

10	Moti Nagar DLF Industrial Area	Printing, Wire Drawing, Automobile Servicing	304.665
11	Non Industrial Area		73.149
12	Badli Industrial Estate	Printing, Metal Finishing, Wire Drawing, Cold Re Rolling	30.576
13	Bawana Industrial Area	Automobile Servicing, Mfg. of Card Board, Printing, Wire Drawing & Corrugated Boxes	35.176
14	G.T. Karnal Road Industrial Area	Printing, Automobile Servicing, Light Engineering Works	47.43
15	Narela Industrial Area	Light Engineering Works, Manufacturing of Plastic Items, Electroplating	15.595
16	Rajasthan Udyog Nagar Industrial Area	Wire Drawing, Automobile Servicing	28.64
17	S.M.A Industrial Area	Pickling of Metal Sheet, Automobile Servicing, Light Engineering Works	22.582
18	S.S.I Industrial Area	Pickling of Metal Sheet, Automobile Servicing	26.66
19	Mohan Co-operative Industrial Area	Miscellaneous	38.91
20	Non Industrial Area		35.6
21	Shahdara Industrial Area (North of GT Road)	Wire Drawing, Automobile Servicing	2.08

22	Non Industrial Area		26.8
23	Lawrence Road Industrial Area	Printing , Mfg of Polythin bags	1.66
24	Mangolpuri Industrial Area	Printing, Automobile Servicing, Light Engineering Works	34.984
25	Samaipur Industrial Area	Printing	0.56
26	Wazirpur Industrial Area	Cold Re Rolling, Automobile Servicing, CETP	85.79
27	Non Industrial Area		123.612
28	Mayapuri Industrial Area	Printing, Automobile Servicing, Light Engineering Works	105.875
29	Naraina Industrial Area Phase - I	Printing, Automobile Servicing, Light Engineering Works	57.84
30	Non Industrial Area		99.613
31	Non Industrial Area	Automobile Servicing	84.7
32	Non Industrial Area	Automobile Servicing	80.919
33	Mohan Co-operative Industrial Area	Printing, Automobile Servicing	41.77
34	Okhla Industrial Area	Printing, Automobile Servicing	290.4025
35	Okhla Flatted Factory Complex	Printing Work	1.37
36	Okhla Industrial Estate	Printing, Automobile Servicing	6.025
37	Non Industrial Area		0

38	Jhandewalan Falatted Factory Complex	Printing Work	0.02
39	Shahzada Bagh Industrial Area	Printing, Manufacturing of Printing Material	14.06
40	Non Industrial Area	Petrol Pumps cum Service Station	44.715
41	Friends Colony Industrial Area	Wire Drawing, Printing	48.265
42	Jhilmil Industrial Area	Wire Drawing, Service Station, Printing	43.382
43	Patparganj Industrial Area	Service Station, Printing, Light Engineering	140.995
44	Non Industrial Area		1.56
	Total		2317.8985
	CETP Sludge		1880.4
	Grand Total		4198.2985

Data provided by DPCC indicates that approximately 2318 MT of hazardous waste is generated per annum from 1123 no. of factories and 1880.4 MT of HW from 13 CETP in Delhi. The hazardous waste generated in Delhi is approximately 4197.76 MTA. This number is lower than the hazardous waste predicted by DPCC in the waste inventorisation report of 2007 (5282 tonnes), because the fact that number of Factories have decreased over last few years.

Above table indicates that Motinagar DLF Industrial Area (304.665 TPA) followed by Okhla industrial area (290.40TPA), followed by Patparganj industrial area (141 TPA) are the major hazardous waste producing areas in Delhi. Hazardous waste generated from different industry type has also been classified in the following table.

e. Hazardous Waste from CETP

13 CETPS in Delhi are currently generating approximately 1880 TPA of hazardous waste, which has been stored in their premises. The current stock piled waste from CETP is approximately 20456 tonnes, which is being stored in sheds at various CETP. The total sludge stockpiled till Feb 2018 (Project Start date) will be approximately 23442 Tonnes.

Table: CETP Table

S. No.	Name of CETP	Sludge Generation (TPA)	Total Sludge accumulated till date 22/2/2014 (MT)	Sludge accumulation till July 2016 (MT)	Sludge accumulation till Feb 2018 (MT)
1	Okhla	149.196	1324	1684.557	1920.784
2	Naraina	126.624	1234	1540.008	1740.496
3	Mayapuri	47.196	270	384.057	458.784
4	Badli	105.744	574	829.548	996.976
5	Bawana	280.992	452	1131.064	1575.968
6	G.T.K.	41.4	1080	1180.05	1245.6
7	Lawrence Road	38.256	419	511.452	572.024
8	Mangolpuri		320	320	320
9	Narela	158.136	1957	2339.162	2589.544
10	SMA	111.996	2078	2348.657	2525.984
11	Wazirpur	738.216	5806	7590.022	8758.864
12	Nagloi	42.96	263	366.82	434.84
13	Jhilmil	39.684	144	239.903	302.736
	Total	1880.4	15921	20465.3	23442.6

Total 4197 tonnes of hazardous waste is generated per annum in Delhi. The sludge from individual ETP and CETP is approximately 2487 tonnes per annum, which is approx. 59 % of the total hazardous waste generated in Delhi. Used and spentoil presents the second largest category of hazardous waste with 885 tonnes per annum, which is approximately 20% of the total.

f. Existing Hazardous Waste Management Scenario in Delhi

Storage of Hazardous Waste

Factories in Delhi are required to keep garbage at the source under the Hazardous Waste Management Rules 2016 and DPCC recommendations. During the field inspection, it was discovered that the companies had created temporary arrangements for hazardous waste storage within their facilities. The garbage was currently stored in an isolated area within industrial premises under roof in a leak-proof plastic container on cemented floor or on a water-proof surface. The canisters were labelled in red to indicate hazardous waste. However, in most businesses, the amount of garbage hoarded appears insignificant in relation to the overall hazardous waste created by the industry. The majority of enterprises keep records for on-site hazardous waste storage. According to informal discussions with industry representatives and owners, hazardous garbage is being dumped alongside municipal rubbish in numerous regions. Furthermore, there is a market for some types of hazardous trash that are supplied to unlicensed dealers.

g. Storage of Waste at CETP

The CETP however, have made adequate provision for storage of waste water sludge and other hazardous waste on the plant site. Sludge generated from the wastewater treatment plant (CETPs) is pilled up under covered concrete shed. CETP societies are constantly approaching the research institutes and Factories in and outside Delhi to identify mode of utilisation of CETP.

3. Potential Environmental Impacts from the Hazardous waste

Hazardous waste has a severe ecological impact. The volume of waste produced by the factories on a frequent basis has a consequence on the air, ground, water, and animals' wellbeing. Despite the fact that there are standards in place to assist us in properly disposing of waste, contaminating yet happens on a continuous basis.

Short-Term Effect: The most immediate danger is water pollution. Substances thrown into our rivers, lakes, and reservoirs made them unsafe for drink or farming use. When flora and fauna drink from these liquids, they grow sick and dies, possibly affecting the health in downstream locations.

Long-Term Repercussions Animal mutations, human cause diseases, waste in our waterways and natural areas, and the destruction of variety of natural resources are just a few instances. Bee populations, which are good for maintaining plant quality, are losing off faster than they can regenerate as a result of human pollution. Toxicants can penetrate the soil and damage plant growth even if spills are quickly contained. Another lengthy effect of hazardous waste is the damage it poses to our water supply. Substances have the ability to seep the soil and reach groundwater storage. What begins as a little spillage in a small area might quickly spread to harm a large area. Worryingly, the true impact of this might go unnoticed for a lengthy period of time. Because bodily fluids are another sort of hazardous waste that is commonly thrown improperly, we now have to be worried about the spread of human illness. Other forms of environmental contamination, such as lead and mercury, pose serious health risks, particularly to children in impoverished countries. Over time, they build up in tissue, environmental toxins, tremors, poisoning, and death. accumulate in tissue over time, causing cancer, convulsions, poisoning, and death.

Hazardous waste can have major short- and long-term health consequences:

- Irritation of the eyes and skin
- Burns caused by chemicals
- Breathing difficulties

- Headaches
- Nausea
- Anomalies in behaviour
- Cancer
- Mutations in the genome
- Mistakes in physiology (kidney failure, reproductive impairment)
- Physical alterations
- Birth flaws

4. Research Methodology

Empirical research methodology is used. An online questionnaire was used to acquire primary data from Delhi based Factories about the Perception, Knowledge and Behavior towards the Hazardous Waste Management. Here we are using Chi square test to test the hypothesis.

We will do primary research by having the online survey to the factories based in Delhi.

This paper seeks to examine how Delhi-based Factories perceive hazardous waste disposal mechanisms and environmental upkeep, as well as related hazards and behaviour. The study investigates the behaviors, perceptions, and knowledge of Delhi-based Factories about hazardous waste management. A structured questionnaire survey involving Delhi-based Factories has been used as a approach.

To properly develop the survey questions, it is vital to learn about the perception, knowledge, and behaviour of Delhi-based Factories about hazardous waste management. These questions are related to the attributes listed below. (1) Hazardous Waste Perception, Behavior, and Knowledge, (2) Economic Benefit, (3) Knowledge, and (4) Industry Willingness The survey was completed by 38 participants from various Factories in Delhi, 31 of them are men and 7 of whom are women. The majority of the participants are between the ages of 30 and 50. The majority of them have a graduate or postgraduate degree. On the basis of the survey results, inferences, suggestions, conclusions, and recommendations have been made that may assist stakeholders in managing hazardous waste in accordance with the regulations and standards.

Market research could be tailored using basic research method. This allows specific issues to be dealt while keeping the studies concentrated on the research questions and the research and scope. This shows that the work is focused on a particular industry rather than a general market.

The client also has ultimate control over the method adopted, including the appropriate sampling quantity and sampling techniques procedure, with this form of research. This helps to increase the research's significance to the individual or an organization.

Secondary information is commonly out from current date and may no more be meaningful the analyst is looking to establish. Primary information ensures that the information received is relevent, permitting for efficient prediction.

Primary information also gives the individual or organisation authority over the data. One may select to make the content accessible to boost their sense of ownership and pride in the domain, or they might just like to keep it hidden to protect competitors from acquiring an edge.

Inference, suggestion, conclusion and recommendations have been made on the result of the survey which might help the stakeholder to manage the waste from the electrical & electronics items as per the rules and guidelines with an ease.

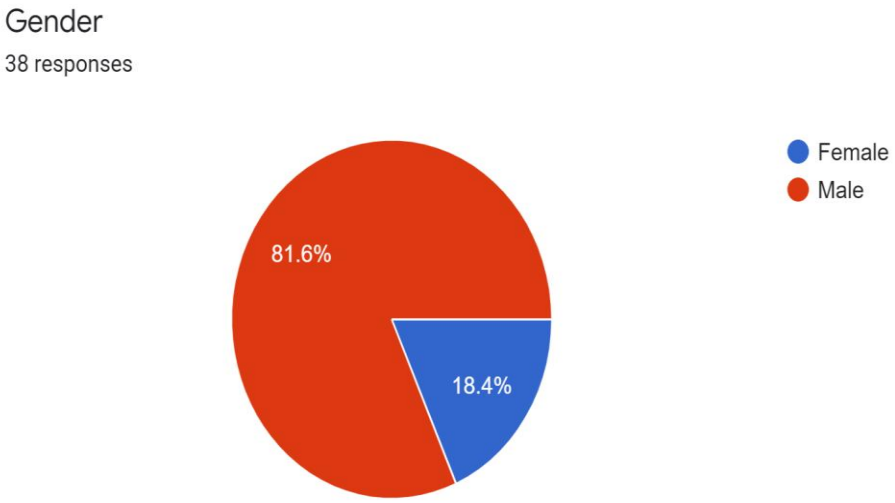
Quizzes are a low-cost way to sample a large number of individuals. These follow a sequence of simple queries that are usually multiple choice. This enables the researchers to gather all the necessary quantitative information.

To acquire more specific information which allows for research design, the multiple-choice questions could be expanded by open-ended questions.

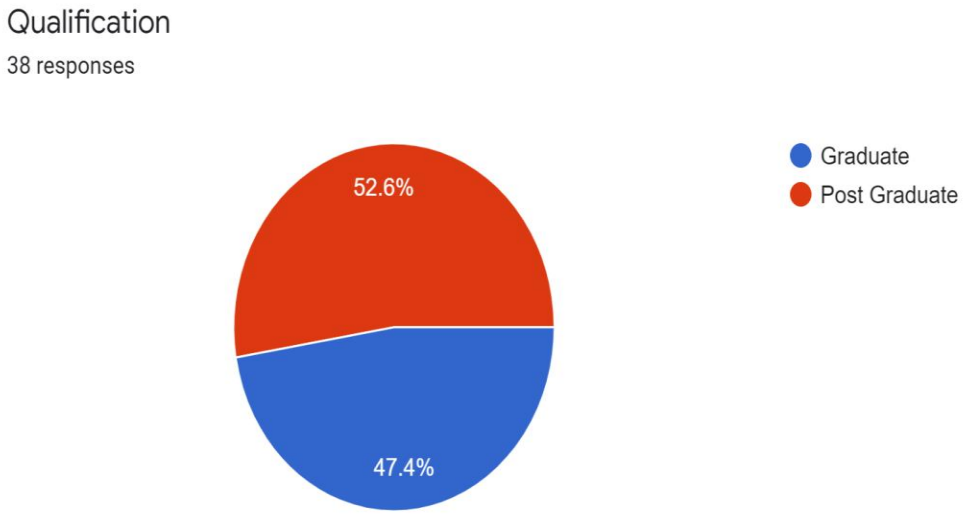
To summarise, basic research is a significant choice for people and institutions looking statistics to satisfy a given need or clarify a specific issue. Although it is more costly and time than obtaining secondary data, the returns often surpass the expenditures.

5. Data Analysis & Data Interpretation

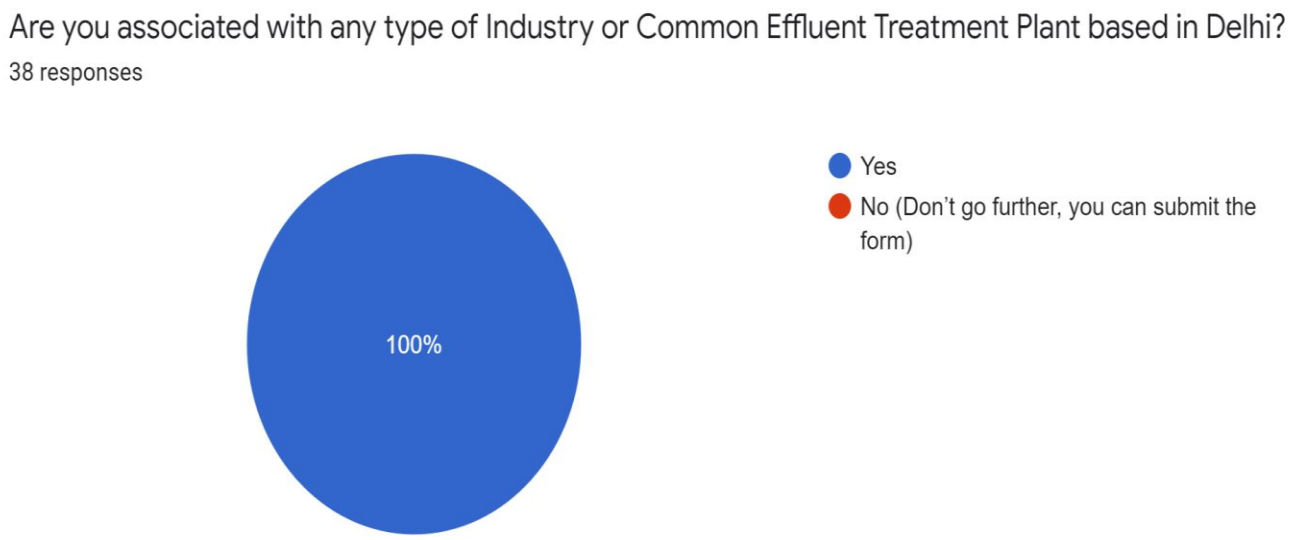
Survey has been responded by 38 participants out of which 31 Male and 7 Female has responded to the survey representing 38 Factories. Average age range for most of the participant is 30 to 50 years. Majority of them are having Graduate, Post graduate. Survey question covers the question based on the Perception, Knowledge and Behavior towards the Hazardous Waste Management by Delhi based Factories.



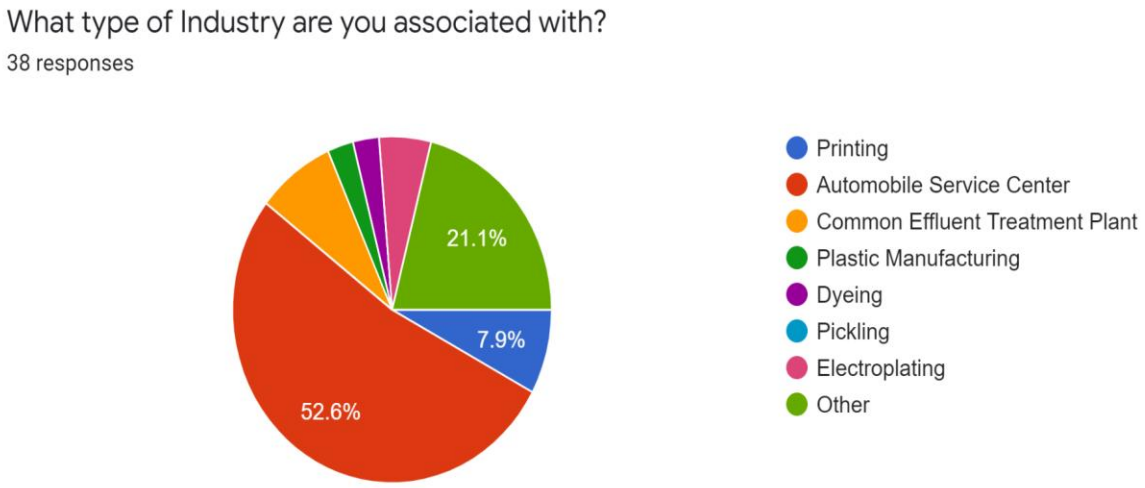
31 Males and 7 Females has responded to the Survey Questionnaire



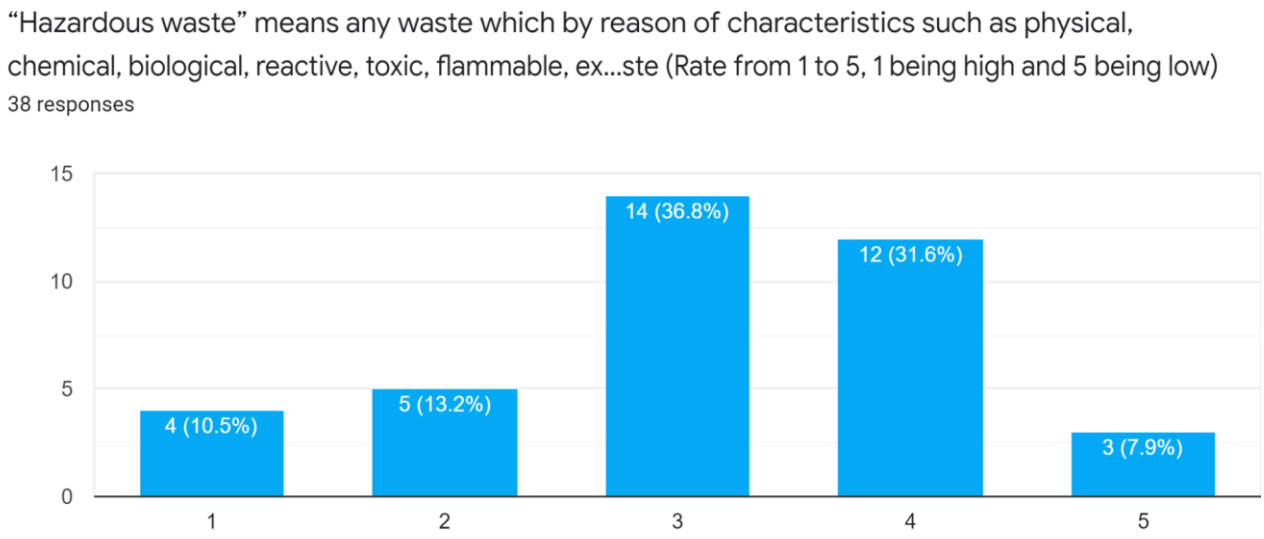
20 of the Participant are Post Graduate & 18 of the Participants are Graduate



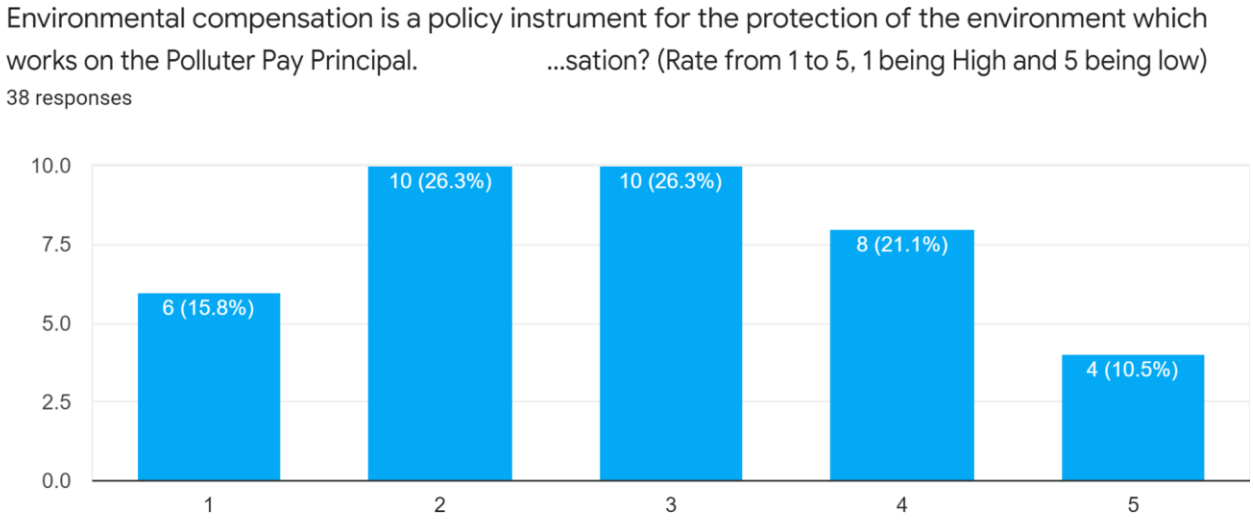
All the 38 participants belongs to the Industry or Common Effluent Treatment Plant based in Delhi



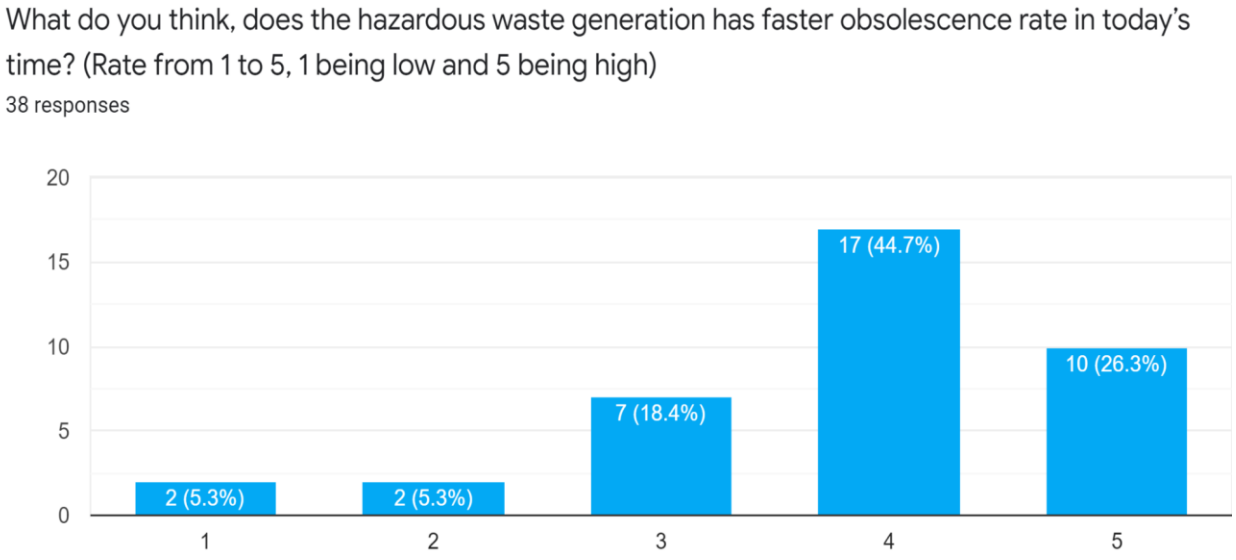
Most of the Participants belong to Automobile Service Center



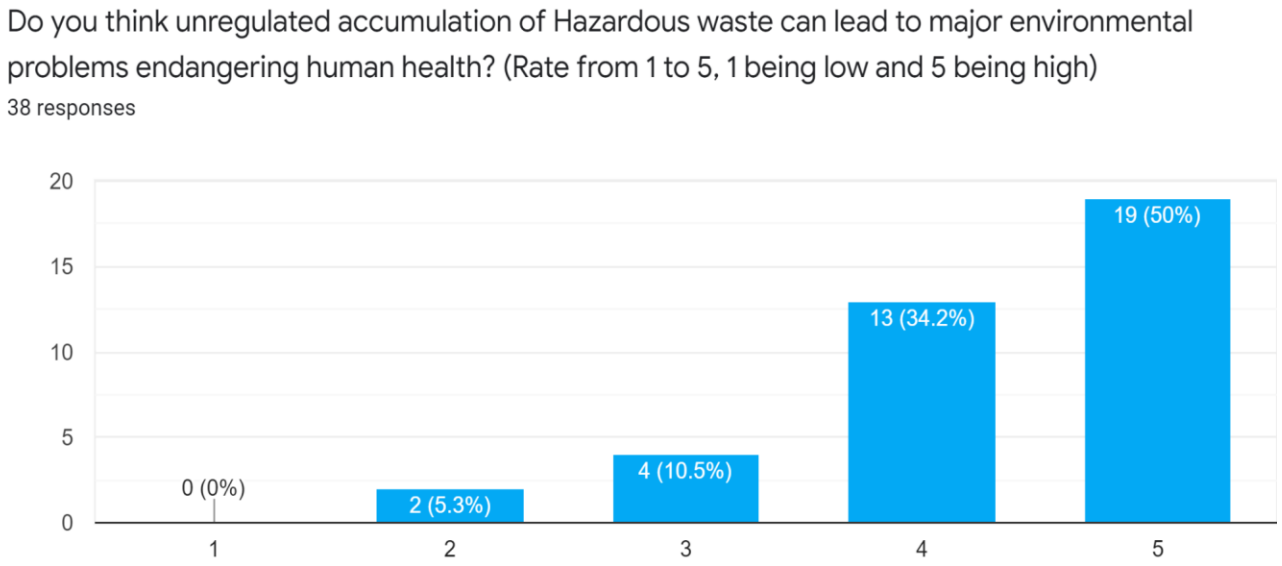
Most of the participants don't know much about the hazardous waste



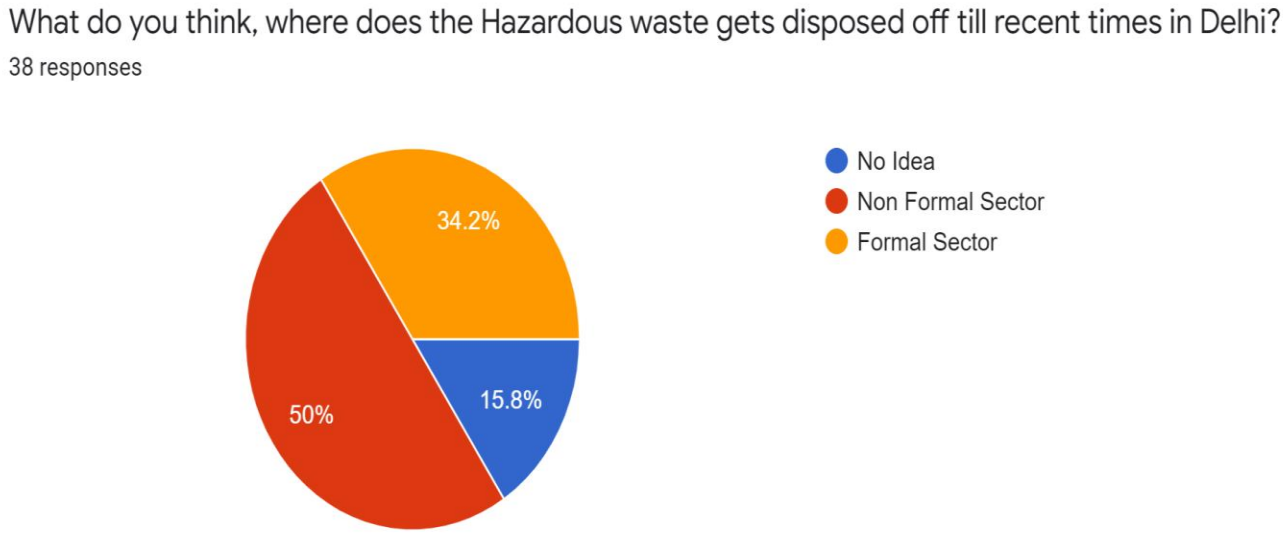
On average participants knows about the Environmental Compensation



Most of the participants thinks that the hazardous waste has the faster obsolescence rate in today's time

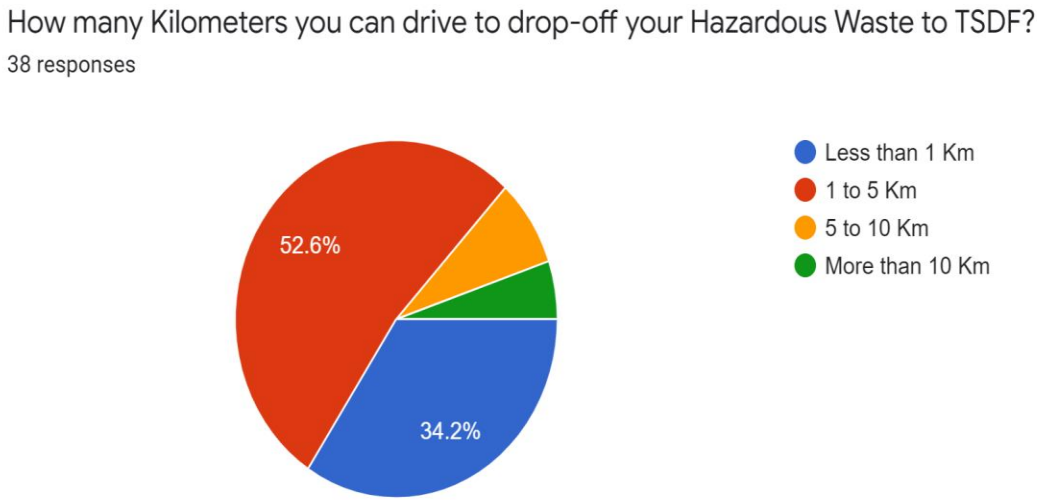


Most of the participants think that the hazardous waste can lead to major environmental problems endangering human health

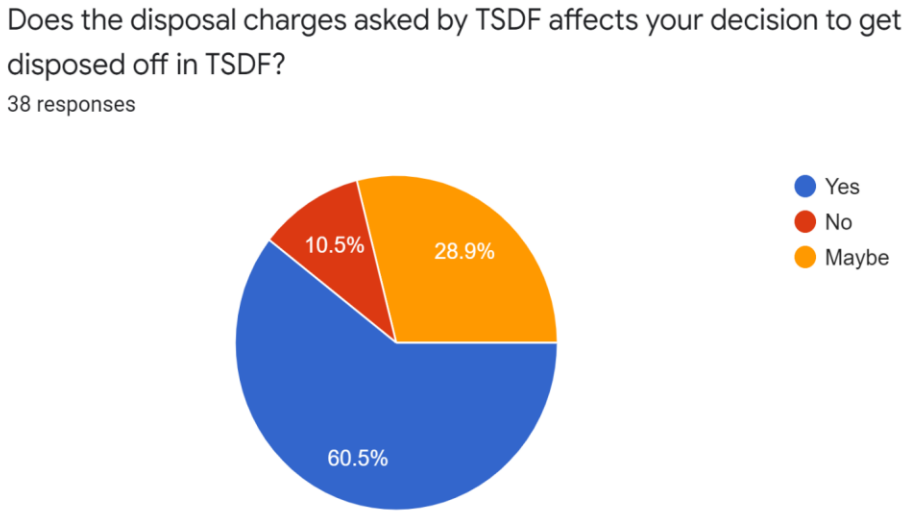


Most of the participants think that the hazardous waste gets disposed in the Non Formal Sector

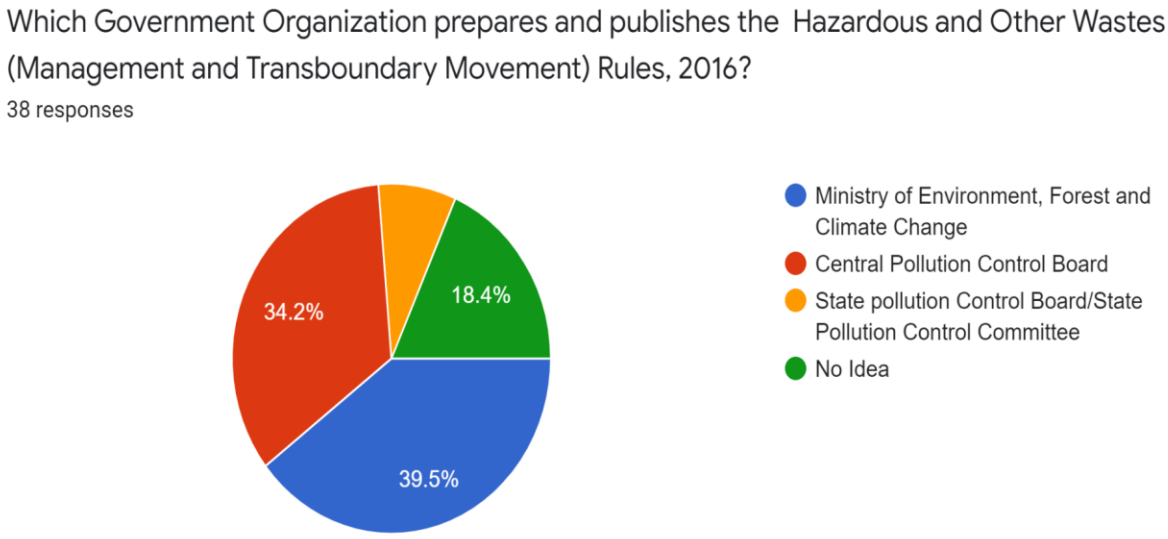
Most of the participants thinks that the hazardous waste don't get properly disposed off in Delhi



Major of the participants/Factories can travel up to 5 Km to drop off the Hazardous Waste to TSDF



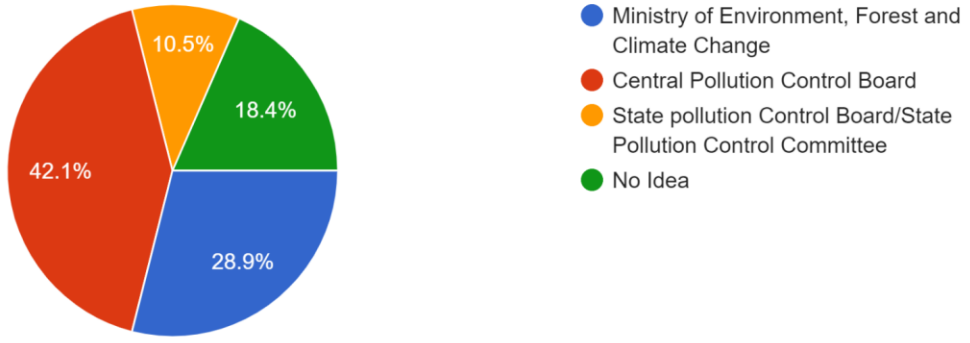
Disposal charges asked by the TSDF affect the decision to get the Hazardous waste disposed of in TSDF



Correct answer to the question is the Ministry of Environment, Forest and Climate Change. Most of the participants are not aware of this.

Which Government Organization prepares and publishes the Guidelines & SoP for Hazardous Waste Diposal ?

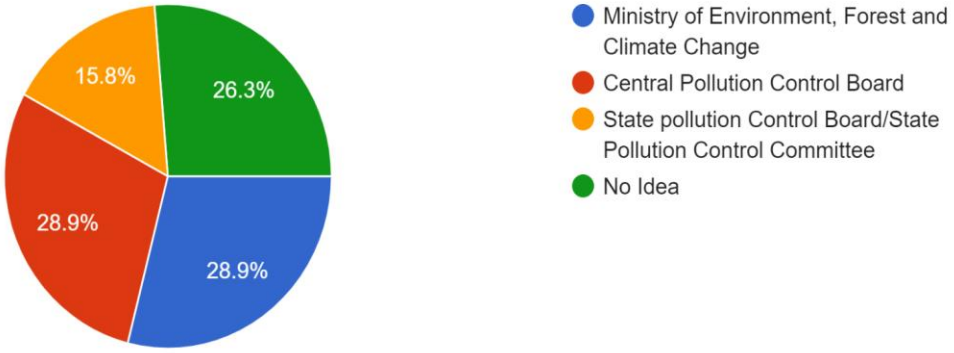
38 responses



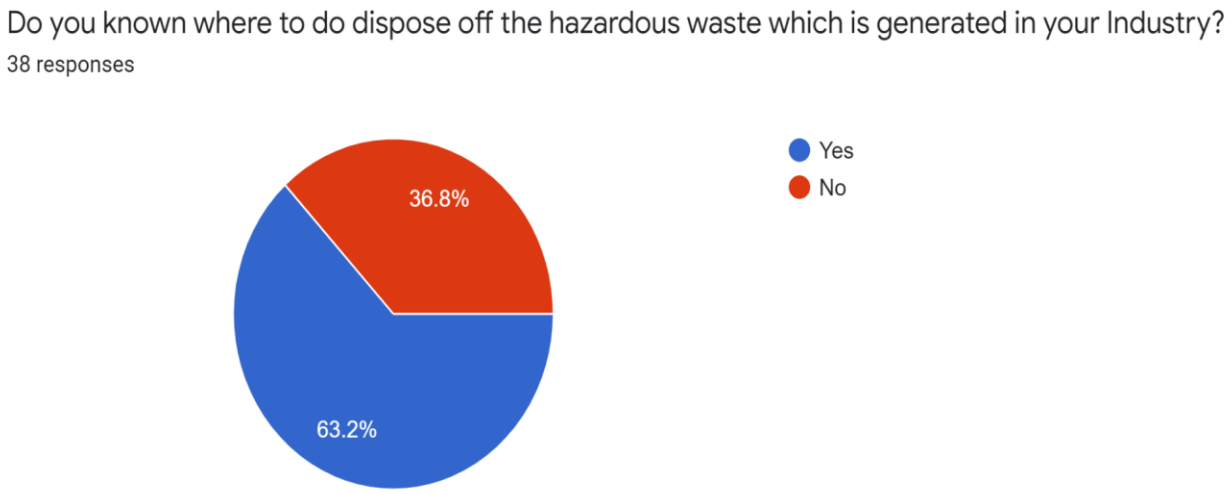
Correct answer to the question is the Central Pollution Control Board. Most of the participants are not aware of this.

Which Government Organisation gives the CTE, CTO & Authorization?

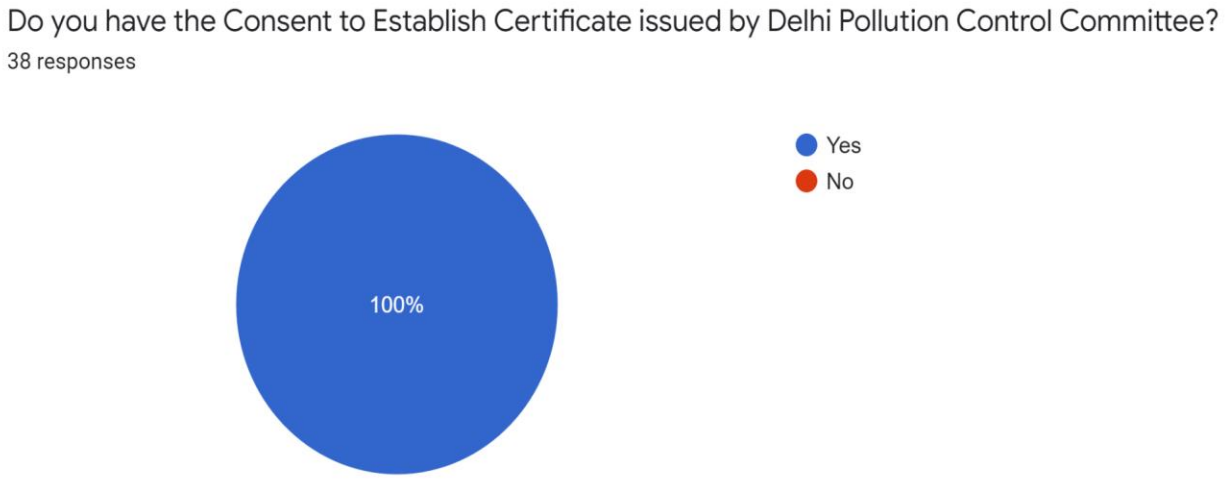
38 responses



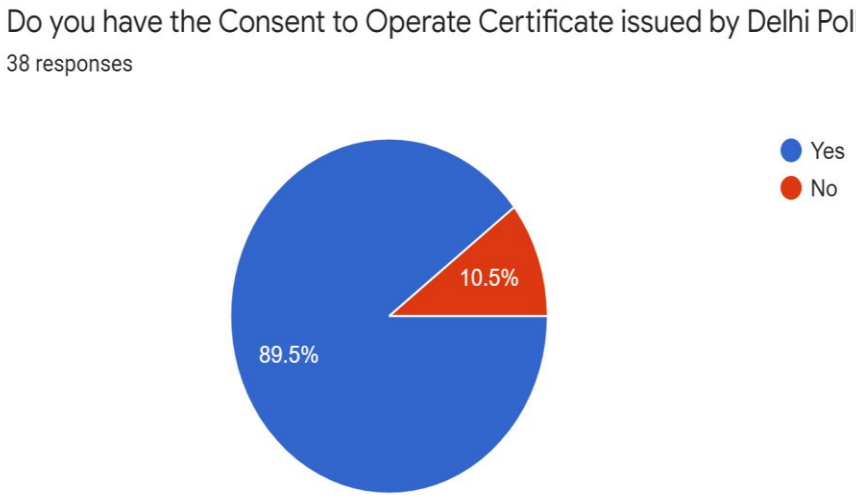
Correct answer to the question is the state pollution control board / State pollution control committee. Most of the participants are not aware of this.



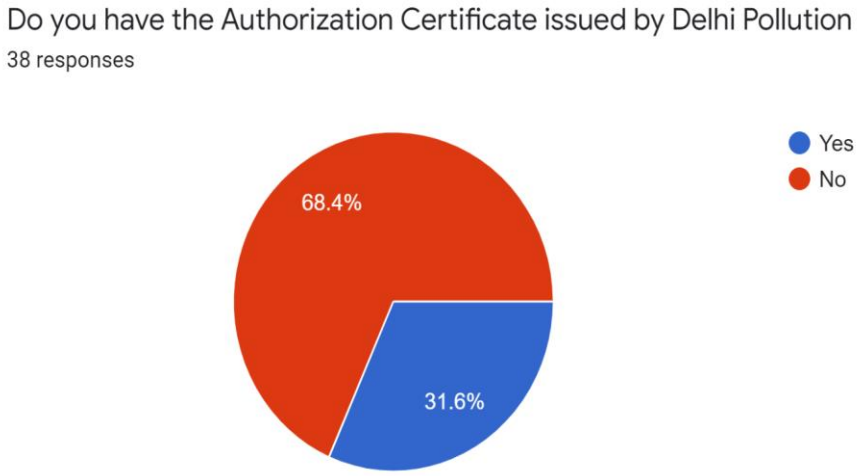
Majority of the participants knows where to dispose off the hazardous waste which is generated in their industry.



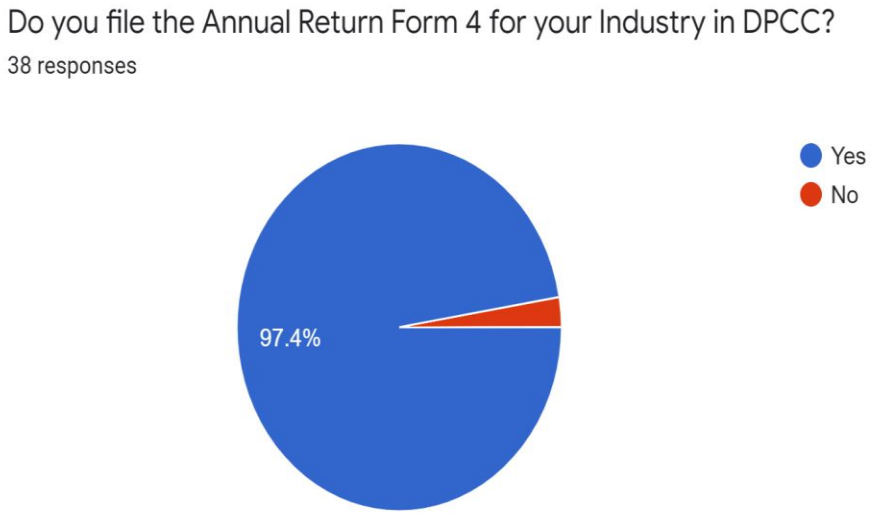
Every Industry has the consent to establish certificate issued by Delhi Pollution Control Committee



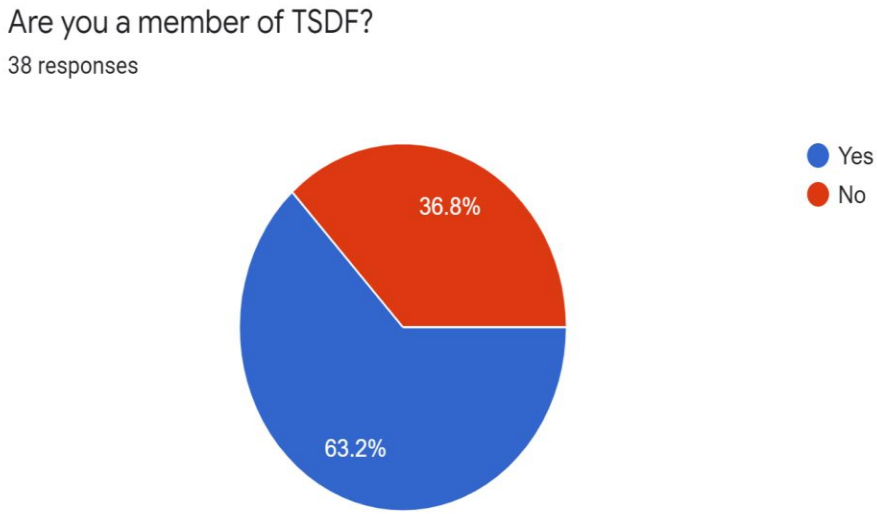
Majority of the Industry has the Consent to Operate certificate issued by Delhi Pollution Control Committee



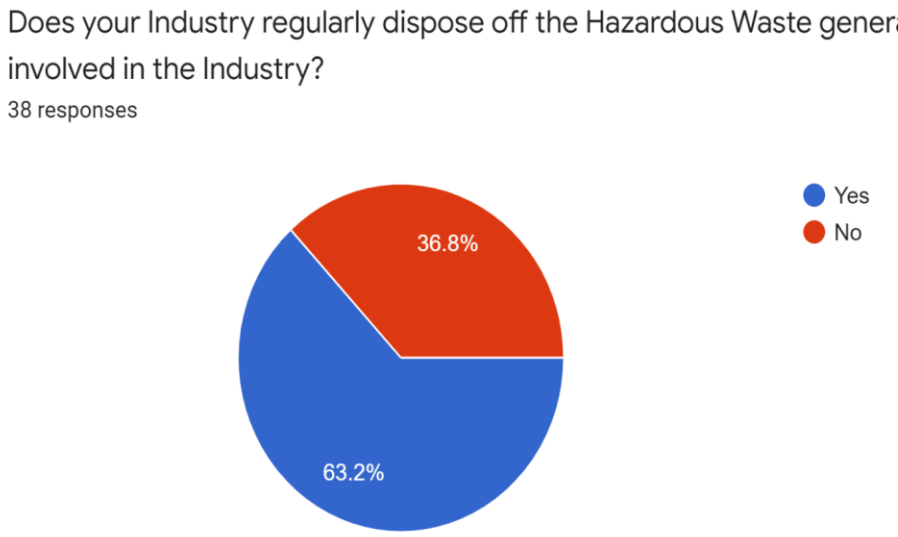
Many of the Factories don’t have the Authorization



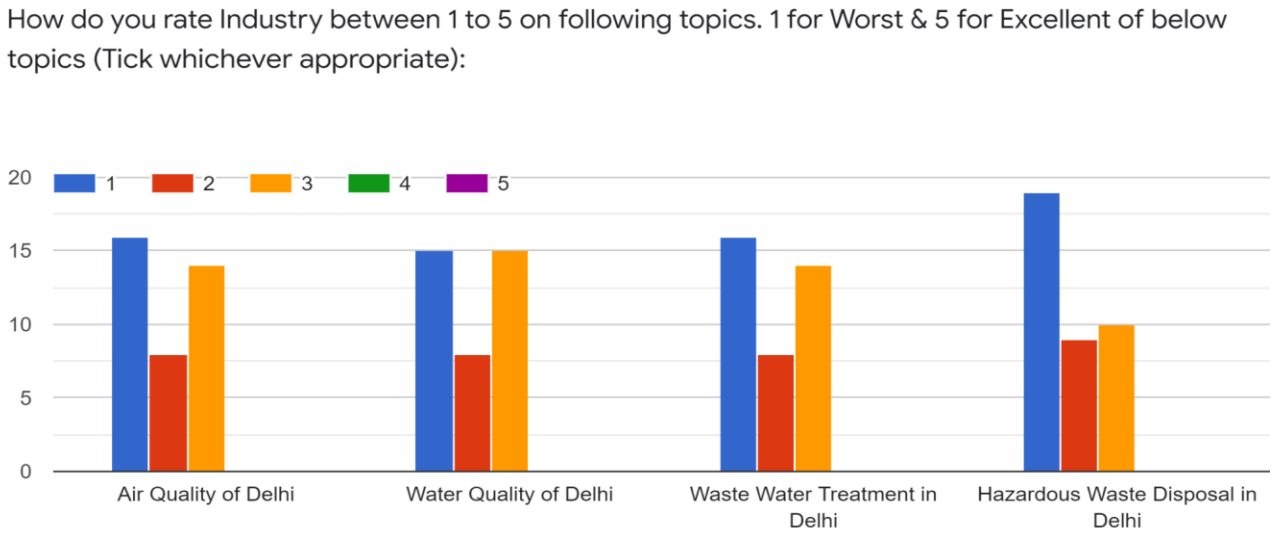
Almost all the Factories files the Annual Return Form 4 in DPCC



Many of the Factories are members of the TSDF



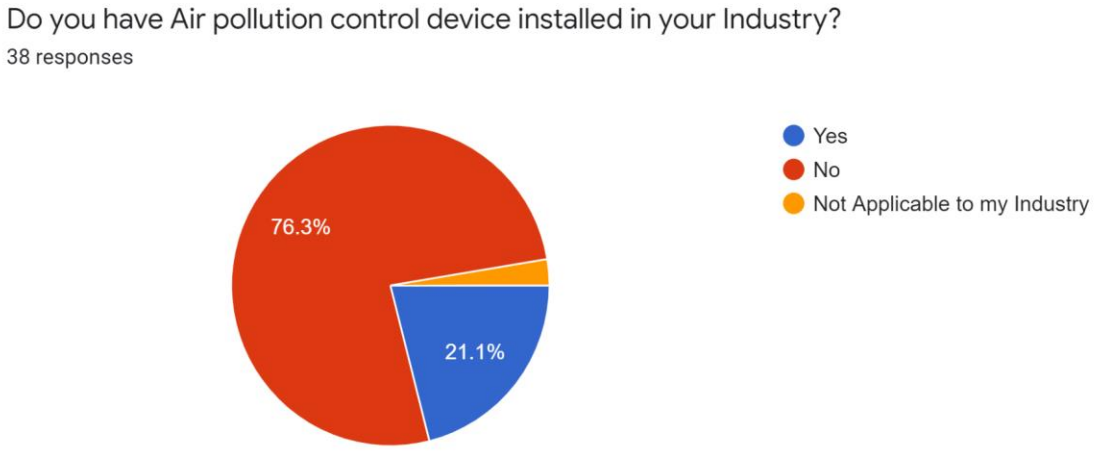
Most of the Factories regularly dispose of the Hazardous waste generated from the process involved in the Factories



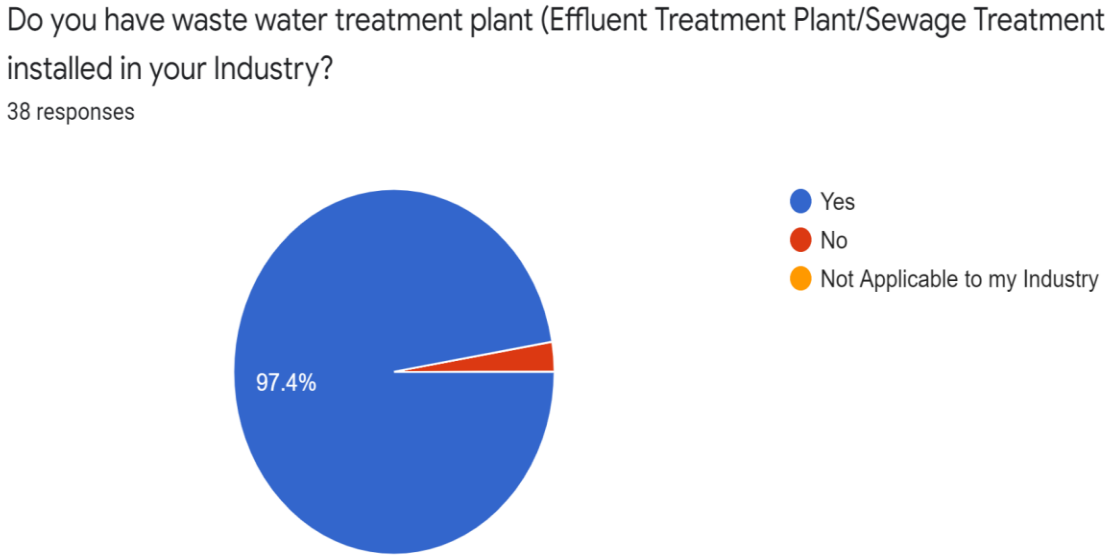
Air Quality of Delhi: Most of the participant thinks that it is not good
Water Quality of Delhi: Most of the participant thinks that it is not good
Wastewater Treatment in Delhi: Most of the participant thinks that it is not good
Hazardous Waste Disposal in Delhi: Most of the participant thinks that it is not good

All of the Participants agrees if hazardous waste doesn't get disposed properly it will damage our environment and lives

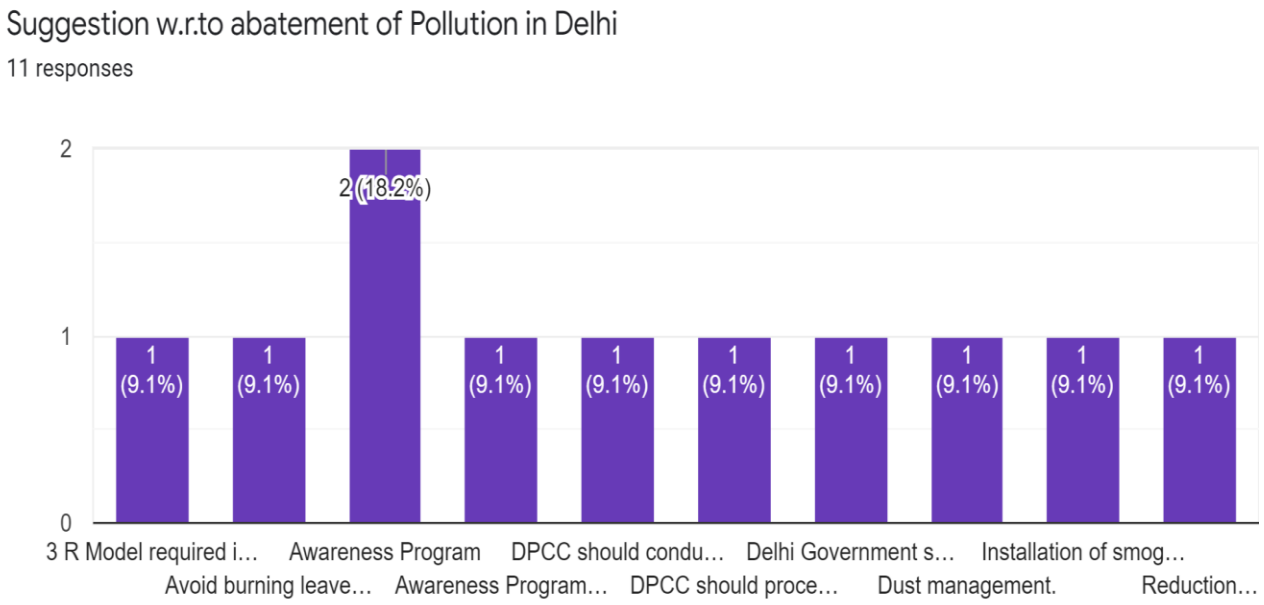
Majority of the participants don't agree with the environment compensation to be imposed for the defaulters Factories



Many of the Factories don't have the air pollution control devices



All the Industry has wastewater treatment plant



We have asked the Participants for the suggestion w.r.to abatement of Pollution in Delhi

We have received 11 suggestions, some of the suggestion is mentioned below:

- 3 R (Reduce, Recover and Recycle) Model required in Delhi
- Avoid burning of waste
- Awareness Program need to be conducted
- DPCC should process the Authorization file of the Factories
- Delhi Government should come new efficient plan
- Dust Management
- Reduce the vehicle emission and waste burning

6. Chi- Square Hypothesis Testing

Test 1:

Relationship between gender & the knowhow about the Hazardous waste

H0 (Null Hypothesis): There is no difference between gender on the knowhow about the Hazardous waste

H1 (Alternate Hypothesis): There is significant difference of gender on the knowhow about the Hazardous waste

Expected						
How much do you know about the Hazardous waste (Rate from 1 to 5, 1 being high and 5 being low)	1	2	3	4	5	
Male	2	3	12	11	3	31
Female	2	2	2	1	0	7
	4	5	14	12	3	38

Observed						
How much do you know about the Hazardous waste (Rate from 1 to 5, 1 being high and 5 being low)	1	2	3	4	5	
Male	3.26315789	4.07894737	11.4210526	9.78947368	2.44736842	31
Female	0.73684211	0.92105263	2.57894737	2.21052632	0.55263158	7
	4	5	14	12	3	38

P value= 0.21039722

P value is less than 9.488, so null hypothesis H0 is accepted

Test 2

Relationship between gender & the knowhow about the Environmental Compensation

H0 (Null Hypothesis): There is no difference between gender on the knowhow about the Environmental Compensation

H1 (Alternate Hypothesis): There is significant difference of gender on the knowhow about the Environmental Compensation

Expected						
How much do you know about the Environmental Compensation? (Rate from 1 to 5, 1 being High and 5 being low)	1	2	3	4	5	
Male	3	7	10	8	3	31
Female	3	3	0	0	1	7
	6	10	10	8	4	38

Observed						
How much do you know about the Environmental Compensation? (Rate from 1 to 5, 1 being High and 5 being low)	1	2	3	4	5	
Male	4.89473684	8.15789474	8.15789474	6.52631579	3.26315789	31
Female	1.10526316	1.84210526	1.84210526	1.47368421	0.73684211	7
	6	10	10	8	4	38

P value= 0.05977713

P value is less than 9.488, so null hypothesis H0 is accepted

Test 3

Relationship between gender & hazardous waste generation have faster obsolescence rate in today's time

H0 (Null Hypothesis): There is no difference between gender on hazardous waste generation have faster obsolescence rate in today's time

H1 (Alternate Hypothesis): There is significant difference of gender on hazardous waste generation have faster obsolescence rate in today's time

Expected						
What do you think, does the hazardous waste generation have faster obsolescence rate in today's time? (Rate from 1 to 5, 1 being low and 5 being high)	1	2	3	4	5	
Male	2	2	6	13	8	31
Female	0	0	1	4	2	7
	2	2	7	17	10	38

Observed						
What do you think, does the hazardous waste generation has faster obsolescence rate in today's time? (Rate from 1 to 5, 1 being low and 5 being high)	1	2	3	4	5	
Male	1.63157895	1.63157895	5.71052632	13.8684211	8.15789474	31
Female	0.36842105	0.36842105	1.28947368	3.13157895	1.84210526	7
	2	2	7	17	10	38

P value= 0.8622783

P value is less than 9.488, so null hypothesis H0 is accepted

Test 4

Relationship between gender & unregulated accumulation of Hazardous waste can lead to major environmental problems endangering human health

H0 (Null Hypothesis): There is no difference between gender on unregulated accumulation of Hazardous waste can lead to major environmental problems endangering human health

H1 (Alternate Hypothesis): There is significant difference of gender on unregulated accumulation of Hazardous waste can lead to major environmental problems endangering human health

Expected						
Do you think unregulated accumulation of Hazardous waste can lead to major environmental problems endangering human health? (Rate from 1 to 5, 1 being low and 5 being high)	1	2	3	4	5	
Male	0	2	2	11	16	31
Female	0	0	2	2	3	7
	0	2	4	13	19	38

Observed						
Do you think unregulated accumulation of Hazardous waste can lead to major environmental problems endangering human health? (Rate from 1 to 5, 1 being low and 5 being high)	1	2	3	4	5	
Male	0	1.63157895	3.26315789	10.6052632	15.5	31
Female	0	0.36842105	0.73684211	2.39473684	3.5	7
	0	2	4	13	19	38

P value= 0.35137508

P value is less than 7.815, so null hypothesis H0 is accepted

Test 5

Relationship between gender & where the Hazardous waste does gets disposed off till recent times in Delhi

H0 (Null Hypothesis): There is no difference between gender on where the Hazardous waste does gets disposed off till recent times in Delhi

H1 (Alternate Hypothesis): There is significant difference of gender on where the Hazardous waste does gets disposed off till recent times in Delhi

Expected				
What do you think, where does the Hazardous waste gets disposed off till recent times in Delhi?	No Idea	Non Formal Sector	Formal Sector	
Male	4	15	12	31
Female	2	4	1	7
	6	19	13	38

Observed				
What do you think, where does the Hazardous waste gets disposed off till recent times in Delhi?	No Idea	Non Formal Sector	Formal Sector	
Male	4.89473684	15.5	10.6052632	31
Female	1.10526316	3.5	2.39473684	7
	6	19	13	38

P value= 0.37322109

P value is less than 7.815, so null hypothesis H0 is accepted

7. Benefits of Managing Hazardous Waste

- This will safeguard the environment and the human health
- Many of the materials can recovered and can be reused
- It will reduce the waste load
- Chance of contamination of the hazardous waste in the soil, water and air will reduced
- Waste to Wealth
- Stress on the landfills will be reduced
- Reduce the pollution level
- More Employment
- Reduction in Greenhouse gases.

8. Inference

The following inferences have been made from survey result

- Knowledge about the Hazardous waste is less within the Factories
- Lack of awareness
- Economic Benefit is very much important for the Factories
- Majority thinks that waste is treated in the Non formal sector
- They know about the Rules and guidelines but don’t were to implement

- Almost all thinks that unregulated accumulated waste will degrade the environment and the health
- Many of them thinks the hazardous waste has higher obsolescence rate
- Knowhow of the statutory bodies are very less

9. Suggestions

- Government and the statutory authority should make the strict enforcement for the rules and guidelines for the hazardous waste management.
- Environmental compensation should be imposed on the defaulter who pollutes the environment or risk the human health.
- Statutory authority and stakeholders should provide the awareness program on a short interval.
- Government and the statutory authority should encourage the recycle, reduce, recover model to reduce the load on the landfills as the land is very precious.
- Bar coding system should be implemented for the hazardous and domestic hazardous waste management.
- Awareness Program on micro level should be arranged. 3 R (Reduce, Reuse, Recover) concept should be promoted in efficient and effectively manner.
- Awareness Program for the Domestic Hazardous waste program should be derived separately.
- Annual return form -4 need to be scrutiny
- Flow chart of the Factories needs to be validated by DPCC through site visits.
- Authorisation should be issued to the Factories after checking the document within defined timelines
- Air pollution control devices and anti smog gun should installed in the Factories
- DPCC should get the Inventory done for the Factories, CETP and Hazardous waste generating units

10. Conclusion and Recommendations

The hazardous waste is one of the fast growing wastes in today's time. As the productivity is increasing day by day, the volume of waste is increasing humungous. To address this issue we have all the rules and guidelines in place but we are lacking with the enforcement. From the survey we can see the awareness about this subject and recycling habit is very less among ourselves. An Integrated approach is required.

To address the issue, enforceability from the statutory authority is very much needed. On regular basis awareness program need to be provided to the local community to make them aware of electrical and electronics item waste along with the benefit of the recycling habit to the large masses.

11. References

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12. Annexure Survey Questionnaires

The study of the Behavior, Perception & Knowledge of the Factories based in Delhi towards the Hazardous Waste Management

This report aims to understand how the Delhi based Factories perceive the hazardous waste management disposal mechanism & up keeps of the environment and related risks and behavior. Using the Empirical research methodology will explores the behavior, perception & knowledge of the Factories based in Delhi. The method applied involved a structured questionnaire survey of Factories established within Delhi.

* Required

Email *

Your email

Name *

Your answer

Gender *

- ◯ Male
- ◯ Female
- ◯ Other:

Qualification *

- ◯ Graduate
- ◯ Post Graduate
- ◯ Other:

Age *

Your answer

Are you associated with any type of Industry or Common Effluent Treatment Plant based in Delhi? *

- ◯ Yes
- ◯ No (Don't go further, you can submit the form)

What type of Industry are you associated with? *

- ◯ Printing
- ◯ Automobile Service Center
- ◯ Common Effluent Treatment Plant
- ◯ Plastic Manufacturing
- ◯ Dyeing
- ◯ Pickling
- ◯ Electroplating
- ◯ Other

Industry Name *

Your answer

What do you think, does the hazardous waste generation has faster obsolescence rate in today's time? (Rate from 1 to 5, 1 being low and 5 being high) *

	1	2	3	4	5	
LOW	◯	◯	◯	◯	◯	HIGH

Do you think unregulated accumulation of Hazardous waste can lead to major environmental problems endangering human health? (Rate from 1 to 5, 1 being low and 5 being high) *

	1	2	3	4	5	
LOW	◯	◯	◯	◯	◯	HIGH

What do you think, where does the Hazardous waste gets disposed off till recent times in Delhi? *

- ◯ No Idea

What do you think, does the hazardous waste don't get properly disposed off in Delhi? *

- ◯ Yes
- ◯ No
- ◯ May be

"Hazardous waste" means any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances, and shall include -(i) waste specified under column (3) of Schedule I; (ii) waste having equal to or more than the concentration limits specified for the constituents in class A and class B of Schedule II or any of the characteristics as specified in class C of Schedule II; and (iii) wastes specified in Part A of Schedule III in respect of import or export of such wastes or the wastes not specified in Part A but exhibit hazardous characteristics specified in Part C of Schedule III; *

How much do you know about the Hazardous waste (Rate from 1 to 5, 1 being high and 5 being low)

	1	2	3	4	5	
High	○	○	○	○	○	Low

Environmental compensation is a policy instrument for the protection of the environment which works on the Polluter Pay Principal. *

How much do you know about the Environmental Compensation? (Rate from 1 to 5, 1 being High and 5 being low)

	1	2	3	4	5	
High	○	○	○	○	○	Low

How many Kilometers you can drive to drop-off your Hazardous Waste to TSDF? *

- ○ Less than 1 Km
- ○ 1 to 5 Km
- ○ 5 to 10 Km
- ○ More than 10 Km

Does the disposal charges asked by TSDF affects your decision to get the Hazardous waste disposed off in TSDF? *

- ○ Yes
- ○ No
- ○ Maybe

Which Government Organization prepares and publishes the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016? *

- ◯ Ministry of Environment, Forest and Climate Change
- ◯ Central Pollution Control Board
- ◯ State pollution Control Board/State Pollution Control Committee
- ◯ No Idea

Which Government Organization prepares and publishes the Guidelines & SoP for Hazardous Waste Diposal ? *

- ◯ Ministry of Environment, Forest and Climate Change
- ◯ Central Pollution Control Board
- ◯ State pollution Control Board/State Pollution Control Committee
- ◯ No Idea

Which Government Organisation gives the CTE, CTO & Authorization? *

- ◯ Ministry of Environment, Forest and Climate Change
- ◯ Central Pollution Control Board
- ◯ State pollution Control Board/State Pollution Control Committee
- ◯ No Idea

Do you known where to do dispose off the hazardous waste which is generated in your Industry? *

- ◯ Yes
- ◯ No

Do you have the Consent to Establish Certificate issued by Delhi Pollution Control Committee? *

- ◯ Yes
- ◯ No

Do you have the Consent to Operate Certificate issued by Delhi Pollution Control Committee? *

- ◯ Yes
- ◯ No

Do you have the Authorization Certificate issued by Delhi Pollution Control Committee? *

- Yes
- No

Do you file the Annual Return Form 4 for your Industry in DPCC? *

- Yes
- No

Do you know that Delhi has Treatment, Storage and Disposal Facility (TSDF)? *

- Yes
- No

Are you a member of TSDF? *

- Yes
- No

Does your Industry regularly dispose off the Hazardous Waste generated from the process involved in the Industry? *

- Yes
- No

How do you rate Industry between 1 to 5 on following topics. 1 for Worst & 5 for Excellent of below topics (Tick whichever appropriate): *

	1	2	3	4	5
Air Quality of Delhi	○	○	○	○	○
Water Quality of Delhi	○	○	○	○	○
Waste Water Treatment in Delhi	○	○	○	○	○
Hazardous Waste Disposal in Delhi	○	○	○	○	○

Do you agree if we don't dispose the Hazardous waste in proper manner it will damage our environment and lives? *

- ◯ Yes
- ◯ No

Do you agree if Industries does not dispose off the hazardous waste as per HWM Rules 2016 then Environment Compensation should be imposed on? *

- ◯ Yes
- ◯ No

Do you have Air pollution control device installed in your Industry? *

- ◯ Yes
- ◯ No
- ◯ Not Applicable to my Industry

Do you have waste water treatment plant (Effluent Treatment Plant/Sewage Treatment Plant) installed in your Industry? *

- ◯ Yes
- ◯ No
- ◯ Not Applicable to my Industry

Suggestion w.r.to abatement of Pollution in Delhi

Your answer

Submit Clear form

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