A Study on Waste Disposal Practices and Its Impact In India

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ABSTRACT:

The increasing urbanization and population are the main reasons for the generation of waste in many developing nations, particularly in India. The most common and traditional method of waste disposal in India is landfill yet, it creates harmful effects upon human-beings and environment if it is not properly treated or managed. Hence, several waste disposal practices are implemented and practised in India like incineration, composting, vermicomposting and recycling and so on. Therefore, it is essential to analyze the various waste disposal practices executed in India and its influence upon the environment for well-being of citizens of India. The present study embraces quantitative research analysis method and the convenience sampling method is utilized for selection of samples for study. The survey consists of structured questionnaire related to research topic and it aids in the collection of data from participants of study. The data gathered using survey is analyzed using the Statistical Packages for Social Sciences (SPSS). From the data analysis, the inferences of study are created. The outcomes of investigation reveals that respondents of study are conscious regarding ill-effects caused by improper waste disposal method. The existing laws related to waste disposal should be followed by Indian people for sustainable environment. Also, the most commonly practised waste disposal method in India is landfilling, which is least preferred among the Indian people. There is a strong need for reinforcing laws related to waste disposal by Indian Government and the concept of 3R's(Reduce, Reuse and Recycle) must be established for the effective waste management system among the Indian people.

1. Introduction

Waste is defined as substance which can be of any kind of unwanted liquid, solid or gaseous substance. The poorly treated and managed waste exhibits adverse impacts upon trees, animals, humans and the atmosphere(Ayilara, Olanrewaju, Babalola, & Odeyemi, 2020). Waste is defined as nothing but, which is regarded as no longer useful and it needs to be disposed of (Abah, Nwankwo, & Orgem, 2019). Due to the increasing population across the globe, the electricity, meat, vehicles and various consumer products are consumed in larger amounts by this populace. So, it results to the utilization and consumption of natural resources that aids in manufacturing of various products which in turn generates huge trash and waste(S. Khan, Anjum, Raza, Bazai, & Ihtisham, 2022). Around fifty percent of wastes produced is organic, hence appropriate

management of wastes will considerably decrease pollution causing from inappropriate waste management. The changes in lifestyle and increasing urbanization(Ddiba et al., 2020) has enlarged waste substance and so, as a result pollution occurs in surrounding causing uncontrollable and alarming situations(Babu, Veramendi, & Rene, 2021). An appropriate waste management system can aid in decreasing the adverse impacts caused due to wastes. The Waste Management(WM) includes various activities like collection of waste, classification of waste and finally recycling or disposal(Ahmad, Khan, & Al-Fuqaha, 2020). The separation of waste substances into various categories on the basis of nature of materials is considered as one of the primary activity of waste management and if it is not done properly then, it will impact the entire waste management technique. The appropriate waste collection and disposal are important

to safety and health of individuals residing in any nation(Richter, Ng, Vu, & Kabir, 2021).

The WM is expensive hence, it is necessary to comprehend several efficient, sustainable and nontoxic means of its management. The 3 R's namely reuse, reduce and recycle is the basic principle in waste management because of increase in processing costs, waste generation and reduction in available landfill area(Bhat, Adil, Sikander, Lone, & Malik, 2020). Furthermore, the flexibility in waste management systems is essential for the clean environment and society(Mahyari et al., 2022). In order to improve, assess and describe waste management systems, the data and feedback can be acquired from system analysis. The waste reduction is the top priority of Waste Management System (WMS) for the reason of that waste management is to decrease waste by not producing it further(Pires & Martinho, 2019). The waste reduction can be achieved by means of products reuse(Cole, Gnanapragasam, Cooper, & Singh, 2019). The reuse and reduction of waste aids in preserving natural resources, decreases the waste generation and decreases the costs related to waste disposal. The segregation of waste and recycling is the considered as the significant step in WMS(Jiang, Van Fan, & Klemeš, 2021).

Across the globe, the waste generation is constantly increasing(Ferdous et al., 2021). The quantity of waste produced by a nation is proportional to its populace and the mean living standards of individuals residing in respective nation. The already available waste dumping sites are occupied beyond its capacity therefore, this in turn leads to polluted water sources resulting from the unsanitary environments(Azizpour, Azarafza, & Akgun, 2020). In addition to it, it causes foul odours and smell and the release of toxic metabolites and also gives rise to communicable diseases. In accordance to global waste management market report, it is found out that around three hundred and eighteen and three hundred and thirty eight million tons of various kinds of waste including hazardous wastes were produced around the year of 2000 & 2001 correspondingly(Dharmasiri, 2020). Hence, the adequate waste management is a public responsibility and it provides benefits to entire society.(Pappas et al., 2022) The waste disposal done improperly will affect the entire nation hence, several countries are kept attempting to impose effective policy

regarding disposal of waste. A WMS requires to be financially affordable, environmentally efficient and socially satisfactory, then it is said to be the sustainable one(Heidari, Yazdanparast, & Jabbarzadeh, 2019). Hence, nations across the globe must equip each and every individual of one's country to significantly contribute to keep the surrounding and community clean.

Several developing nations are suffering from new pressure and constraints regarding WM(Mungai, Ndiritu, & Rajwani, 2020). This is mainly due to quantity of waste created by human activities and it is enlarging for every year across the world because of the issues faced during waste disposal(Musa, Abdullahi, Umar, Bello, & Muhammad, 2021). In India, the urban regions produce more waste while compared to rural areas. Also, those wastes are organic in nature and it can be utilized to acquire the remunerative product by means of several sustainable organic waste management approaches like biogas production, composting and vermicomposting(A. Singh, Tiwari, Chandrahas, & Dutt, 2021). Several waste disposal and waste treatment technologies which are currently in practise are bio drying, composting, reuse, sewage treatment, pyrolysis, land farming, dumping, incineration and gasification(Barbhuiya et al., 2021) yet, some techniques may lead to polluted environment and contribute to greenhouse effect(Anshassi, Smallwood, & Townsend, 2022). The least preferred waste management approaches such as lands filling and incineration is being practiced in developing nations and it leads to the poor waste management choice(Hussein, Tsegaye, & Abdulahi, 2020). With respect to waste management techniques, the environmental economy of a nation also needs to be considered. The waste management approaches like biogas production, traditional compositing and vermicomposting exhibits the positive effect upon the environmental and biological economy.

Around the year of 2016, the Environment, Forestry and Climate Change Ministry (MoEFCC) reviewed and passed solid waste management rules by changing the municipal solid waste rules 2000. Yet, in various countries the segregation of waste is still a major challenge. In world environment day of 2017, the ministry of housing and urban affairs (MoHUA) announced the source segregation campaign beneath

Swachh Bharat Mission to motivate to segregate the garbage. According to solid waste management rules of 2016, the biodegradable waste can be treated, managed and disposed using biomethanation or composting of inside the premises. The process of conversion of segregated wastes into another new product or material is called as recycling in accordance to 2016 solid waste management rules. But , it is not effectively implemented(Priyadarshini & Abhilash, 2020). In India, the garbage disposal approach is most commonly utilized for waste disposal(Basu et al., 2019). The waste dumps which are being utilized as the dumping sites are usually unmaintainable since it is devoid of soil cover, foundations, leachate cover or processing capabilities. It is a collective duty of government, citizens and private shareholders in order to dispose waste effectively in order to improve the quality of living of people. A realistic framework policy must be framed for controlling, managing and disposal of waste(Ifeoluwa, 2019). It is the duty of government municipalities to execute efficient waste management services that involves removal, storage, transportation and lastly, the waste disposal(Haywood, Kapwata, Oelofse, Breetzke, & Wright, 2021).

1.1 Problem statement

Several developing nations face the issue in handling waste and sometimes, it will leads to unfavourable effects to society(Hoque & Rahman, 2020). The growing trends in quantities of waste will suggestively affect systems panning and infrastructure development(Muhammad, Badi, Haruna, & Mohammed, 2021). The irrational treatment and waste management will affect the environmental footprint(Cheela, Ranjan, Goel, John, & Dubey, 2021). The waste management is a delicate issue across the globe. The ignorance and mishandling has produces several environmental concerns particularly in highly populated nations like India, china, Bangladesh and Pakistan(B. A. Khan, Cheng, Khan, & Ahmed, 2019). Several Indian cities are not segregating the waste in a proper manner and it is found out that those cities are collecting the all kind of waste in a single place(Rana, Ganguly, & Gupta, 2019). Also, the enforcement of proper centralized or decentralized treatment system is not found in those cities situated in India(S. Singh, 2020).

The increasing amount of waste generation paves the way for various concerns with respect to environmental, social and economic features(Pawan, Saharan, & Ranga). The sustainable waste management schemes should be improved to encounter the solid waste management concerns in an effective manner. By considering the significant consequences, there is a need for every nation to choose the optimal waste disposal technology to be employed in one's nation. But, the selection of optimal technology for waste disposal is really a difficult task. This is mainly due to the fact that each and every technology has its own advantages and disadvantages. The incorrect choice of waste disposal technique is considered to be the main issue within the context of solid waste management and it will possess the negative long-term impacts upon economic development and growth. This in turn motivates the investigators to deliver the solutions to issues(Torkayesh, Malmir, & Asadabadi, 2021). The various side effects like food poisoning, dengue outbreaks and etc. are also occurred due to the improper waste disposal. The individuals who are at high risk of health issues are those who are employed for disposal of domestic waste(Akter, Hasan, & Sharmin, 2022).

The scenario of sustainable waste management scenario is a very complex task in India due to altering waste composition and generation of waste rates. The inadequate waste management results to the climatic changes and degradation of environment(Sharma & Jain, 2019). In recent times, the disposal of waste scenario becomes the significant threat while compared to ancient times since now-a-days the waste is mostly organic. The inadequate and inappropriate waste management is harmful to human health and environment (Obuah & Okon, 2017). This is in turn causes air pollution and disturbs the water reserves while trashed into water and also it diminishes ozone layer if it is burnt. Hence, it will affect the climatic conditions. Usually, wastes are not properly processed using traditional methods and it causes harm to humans and environment. The quick growth in technically-manufactured substances like glass, rags, papers, metals, polystyrene and plastics has improved the quantity of inorganic wastes. Across the globe, mostly all nations are enduring the struggle to identify the proper solution to reduce and dispose the waste. Although the few developed nations like Australia, Italy

and Canada have efficiently encountered the waste disposal issue. Yet, the remaining nations across the world which includes various under-developed and developing nations are still trying to establish the standard infrastructure to manage and dispose the waste in an effective manner(Gour & Singh, 2023).

1.2 Research objectives

The main aim of the study is to investigate the various kinds of waste disposal practices implemented in India and its influence upon the environment.

The study has been instigated with the following objectives such as to:

- Analyse the public knowledge and awareness regarding waste disposal in India

- Inspect the actions and measures taken by Indian government and people regarding waste management

- Examine the impacts of waste disposal methods upon human-beings and environment.

1.3 Paper organization

The paper is organised in the following manner in which Section 1 provides the brief introduction about the factors responsible for waste generation and waste disposal techniques. The existing research works associated to the present study is presented in section 2. The proposed study research methodology is elucidated in section 3 and the result and analysis is presented in section 4. The present study outcome is also discussed in the section 4 and the limitation of the study is displayed in section 5. Finally, in section 6, the paper is concluded with the suggestion to overcome the ill-effects caused by the waste disposal techniques.

2. Review of literature

Waste disposal techniques

In recent times, the most important method for WM is waste disposal(Mingaleva, Vukovic, Volkova, & Salimova, 2019). For past few years, the nations across the globe endures issues related to waste disposal like limited space , depletion of resource and pollution and loss of natural resources(Vincevica-Gaile et al., 2023).The most widely utilized method of waste disposal in developing nations is burning of waste in open places(Chaudhary et al., 2021), which is

considered as the worst waste disposal practice across the world(MIHAI, GNONI, MEIDIANA, EZEAH, & ELIA). The poorly treated waste affects the social status and well-being of the individuals. The wastes are increasing continuously across the world and those wastes includes chemical waste, household waste, sludge, building waste , construction waste and hazardous waste and these wastes are required to be disposed of (Abiriga, Vestgarden, & Klempe, 2020). Most of the developed nations converts the waste into a resource to create heat, fuel, compost and energy. But, in developing nations, proper waste disposal remains to be the major issue(Ghosh et al., 2019). Hence, the study(Schmidt et al., 2022) deduces that there is a strong requirement for enhancing the waste disposal practices in developing nations to avoid the harmful effects caused by poorly treated or managed waste. Some of the waste disposal practices are stated below.

Landfills

On or after the origin of development of human reimbursements and the residues accumulation that contains the deposits thrown away by inhabitants is called as landfills and it is being generated for waste disposal. Before 1950, these sites are generally dumpsites where safety, environmental and health implications are not considered which in turn causes the threat to surrounding. The dump sites poses threat to groundwater and it affects the quality of groundwater resources for past few decades(Adenuga & Popoola, 2020). In order to overcome these issues, the investigation is done by researchers to bring awareness among general public about guidelines for the execution of integrated WMS into the circular economy. On the other hand, the part of landfill in modern WMS is considered as the ultimate sink for contaminants and it is still in use. The contemporary landfills is also called as sanitary landfills and it is nothing but, the engineered disposal sites formulated to reduce adverse health and environment impacts meanwhile, greater safety measures are enforced and the waste storage also needs to be enhanced. In prior to deposit waste in landfill, the place needs to be carefully chosen for dumping the waste and its base needs to be shielded by the protection barriers for instance synthetic liners, asphalt and the layer of compacted clay. This in turn will eradicate the leachate infiltrate penetration into ground water bodies(Parrodi et al., 2019).

The landfill is one of the traditional method for waste disposal where waste is dispensed evenly and is concealed with soil layer(Kristanto & Koven, 2019). The engineered sanitary landfills are the final disposal sites for municipal solid waste and it is the environmentally acceptable water disposal technique to reduce environmental pollution. The landfilling is the broadly utilized waste disposal method and it is cheaper when compared with other waste disposal methods(Ogunmakinde, Sher, & Maund, 2019). The engineered sanitary landfill development needs to be capital intensive hence, it is imperative that adequate landfill performance analysis is made to guarantee the optimal usage of available landfill amenities to maximize its operational capacity. Therefore, performance analysis of landfill need understanding and knowledge of landfill waste characteristics and also about the operational activities in landfill site. Even though it is very difficult to assess the engineering properties of landfill waste because of the several materials present in it , the landfill assessment and design is a very crucial step needs to be followed(Owusu-Nimo, Oduro-Kwarteng, Essandoh, Wayo, & Shamudeen, 2019).

Composting

The biodegradation of organic materials to create humus-rich compost is called as composting and it is one of the environment-friendly technique to process organic wastes. The composting process aids in transferring it those from landfills (Sebastian & Louis, 2021). The composting technique aids to safeguard the underground water from getting polluted while compared with the landfilling technique of waste disposal which causes pollution concern to underground water. It is due to the decrease of chemical pollutants and microbes at the time of composting. Those microbes are pathogenic in nature that are detrimental to human beings. The use of compositing will enhance the soil organic matter content with respect to adequate nutrient in composted substances and the availability of plant growth – promoting creatures. It also aids to guarantee food security to larger extent.

Vermicomposting

The vermicomposting is considered as advantageous one while compared to various waste management methods. This is due to the fact that vermicomposting process can be executed in indoors and also in outdoors by allowing entire year round composting. The vermicomposting process permits acquiring organic nutrient sources for crops in limited time. In addition to it, this process is biochemically, nutritionally and physically effective while compared with various composts. The low-cost technology utilized for treatment or processing of organic waste is called as vermicomposting(Alshehrei & Ameen, 2021). The comparative analysis is made among vermicomposting and traditional compositing and it infers that the vermicomposting leads to enhanced compost along with large quantities of K, N and P content and also results in reduction of content of heavy metal. The decomposition of solid waste can be done using vermicomposting process which in turn acts as the effective substitute for chemical fertilizers and therefore, decreasing the pollution also(C. Gupta, Prakash, Gupta, & Nazareno, 2019). Hence, it is suggested to utilize advanced waste into energy by employing vermicomposting technique as an appropriate waste disposal technique.

Incineration

The most commonly utilized treatment technology is incineration particularly for medical waste disposal in accordance to Lee and Huffman (1996). The incineration process decreases the waste quantity to a larger extent along with entire removal of hazardous waste organics and pathogens(Tang, Tang, Maharjan, Aziz, & Bunrith, 2021). The heat emitted from the incineration of municipal solid wastes can be utilized as the input energy for thermal power plants(Yazdani, Salimipour, & Moghaddam, 2020). The decreased waste transportation expenses, decreased land requirement and greater treatment capacity along with the enhanced waste to energy techniques transform the incineration as one of the top most waste disposal method in developing nations like India. After the incineration process, the waste disposal techniques like microwave and integrated steam sterilization ranks the second and third position correspondingly since, it emits non-hazardous deposits while compared with other waste disposal techniques(Manupati, Ramkumar, Baba, & Agarwal, 2021).

Recycling

The most extensively accepted waste disposal technique across the globe is based on the concept of 3R's

(reduce, reuse and recycle)(F. Khan, Ahmed, & Najmi, 2019).The recycling process is defined from 3 aspects such as treatment way, waste source and resource location. The waste resources are usually generated from manufacturing and depletion processes. With the aid of recycling process, the resources are reimbursed again to the manufacturing and depletion process. The recycling process is segregated into reuse and regeneration. The reuse denotes the reasonable processing and circulation of waste to increase the waste value. Also, the regeneration denotes the waste which retain the functions of consumption and production once after the completion of recycling process. At the time of consumption, waste resources produced are insignificant while compared with waste created at the time of production. The path usually wherein the waste resources are created through the production process going back to consumption process once after the process of recycling is often targeted towards energy (Shen, Li, & Wang, 2020).

The recycling is considered as the beneficial one because it reduces waste and also landfills. The recycling process can be applied to sort glass articles, metals, plastics and for the utilization of biodegradable waste. The re-use of metals and the diversion of plastics from landfills is made possible by recycling process(P. K. Gupta, Shree, Hiremath, & Rajendran, 2019). The recycling process also involves the reshaping of glass substances into new materials once after the procedure of deep cleaning is done. Hence, recycling process is an innovative step for reducing the waste by melting and converting the used products into a new one(David, Thangavel, & Sankriti, 2019). In recent times, the recycling industry is conquered by means of dumpster robots that makes the recycling task as an easier one. First, it is necessary to effectively dispose the garbage into recyclable, biodegradable and non-biodegradable products. Hence, it permits the reuse of biodegradable substances to improve the soil content and augment cultivation. The recycling of waste things like plastics and paper are recently on the rise(Dhawan, Bisht, Kumar, Kumari, & Dhawan, 2019).

Re-utilization

The most chosen alternative to recycling process is re-utilization of product since, the product does not require to endure any kind of reshaping or reprocessing before the process of utilization. The re-utilization differs from manufacturing or recycling since, it explicates the usage of increased waste materials along with the capability of being utilized as the raw material for the novel compound. Therefore, this reutilization process displays opportunity for regaining resources which are considered as being valuable and have the capability of reducing the waste amount transmitted to landfills(Idumah & Nwuzor, 2019). The materials created by means of recycling and reutilization is considered to be the effective resolution to problems related to waste management.(Tsai, Bui, Tseng, Lim, & Hu, 2020).The reuse or reutilization is described as the process of using any product parts or products again after its first time use. The reuse of product delivers various advantages like it decreases the emissions of greenhouse gas and pollution and also it decrease the energy and mineral consumption. It also decreases the landfills and waste disposal of solid substances(Bui, Tseng, Tseng, & Lim, 2022). Several developing nations produces the familiar solutions for improving sustainable recycling or reuse like reutilization of waste materials and so on.

Biogas generation

There is a huge requirement to execute the user-friendly and low-cost method for proliferation of biogas technology in country of India. The anaerobic digestion procedure of organic waste material has the capability to generable valuable biogas along with sizeable methane percentage around fifty percent to seventy percent. This in turn decreases the environmental emissions(Kulkarni & Ghanegaonkar, 2019). For centuries, the utilization of petroleum and fossil fuel vanishes the valuable resources and due to its non-renewability nature, it is difficult to replenish. Hence, it encourages the researchers to search for sustainable, renewable and environment-friendly techniques. Within the context of biogas production, the anaerobic digestion technology is gaining interest among investigators in order to prevent the depletion of natural resources. In order to harvest energy from waste materials , biogas production technique can be used(Maurya, Tirkey, Rajapitamahuni, Ghosh, & Mishra, 2019). The increasing level of organic waste in urban regions and the devoid of agricultural land obstruct the biogas profitability(Pelayo Lind et al., 2021).

3. Research Methodology

Research Method

The quantitative method approach is adopted in this research. The quantitative research describes the occurrence by gathering numerical unchangeable detailed data which is being estimated by using mathematical related methods. This in turn provide statistics related to questions of what, when, where, how, how many and how much. It involves the logic, number and objective stance(Baur). The quantitative research analysis is an innovative research through which an investigator interrogates a particular question, gathers quantifiable data from respondents and it estimates those numbers by utilizing statistics and performs the inquiry in an objective and unbiased manner(Mohajan, 2020). The quantitative research uses survey and questionnaire method for the collection of primary data.

The research uses the quantitative data which is gathered by means of questionnaires. The research instrument used in this study is questionnaire and it helped to capture the data regarding knowledge, information, awareness about the waste disposal practices in India and practices used for waste disposal in India from the residents of Delhi. The survey is conducted among the residents of Delhi, India using the structured questionnaire on the basis of variables of research. The questionnaire is managed by means of research assistant.

Study area

The research is conducted among the residents of Delhi, India who are willing to respond to survey. The investigator's experience of living in Delhi for past ten years helped the research to a greater extent in gaining suitable research participants of study. This is in turn aids for successful completion of this research. The survey is conducted by the researcher itself. The participants surveyed for this study are within the researcher's locality therefore, it decreases the travelling cost required for research purpose. This is in turn will make the data collection process easier.

Sample size and population

A sampling strategy is essential since it is not always easy to gather data from each and every unit of populace(Stratton, 2021). Hence, the process of choosing the appropriate sample size is must to decide the number of observations to incorporate in the statistical sample. In addition to it, the sample size is the main characteristic of any of the empirical study and its main objective is to create an inference regarding the populace from the sample(Lakens, 2022). The sample size is described as the number of study units and participants that needs to be incorporated and is vital to encounter the research questions of study. A very large sample is sometimes will incur wastage of cost, resources and time. Meanwhile, the small sample size will not be adequate of producing reliable and conclusive outcomes(Fowler & Lapp, 2019). Hence, it is vital for investigator to assess appropriate sample size to create reliable outcomes with the aid of statistical procedure(Adhikari, 2021). Therefore, the present study pursues the convenience sampling strategy and encompasses the sample size of 47 which is neither smaller nor bigger in order to attain the research purpose in an effective manner. The targeted populace comprises of students, retiree and workers residing in Delhi, India. These particular group of people is selected due to the nature of study and also these people will contribute to the research purpose to a greater extent.

Ethical considerations

In prior to the survey, the personal details of the respondents was gathered. The personal details includes information of residency, full name and description of job and these personal data will not be revealed in order to guarantee the confidentiality to each and every respondent.

4. Results and Discussion

Demographic data distribution of respondents

The total number of around 47 Delhi residents are considered as candidates of the study. The demographic details of the respondents are displayed below in form of tables and graphs.

Age

The table 1 and figure 1 describes about the frequency distribution of age among the forty seven respondents of study.

Table 1. Statistics and frequency distribution of Age

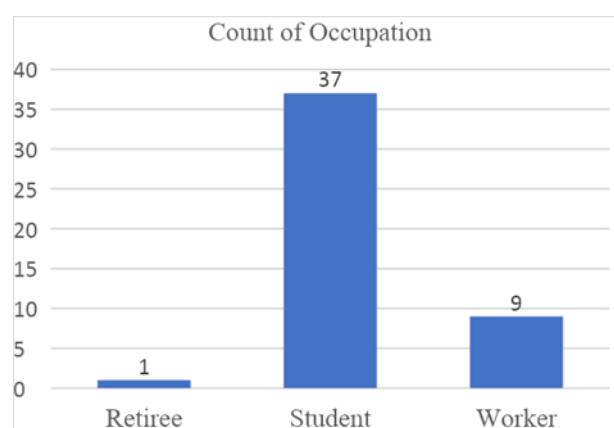| Statistics		
Age		
N	Valid	47
	Missing	0
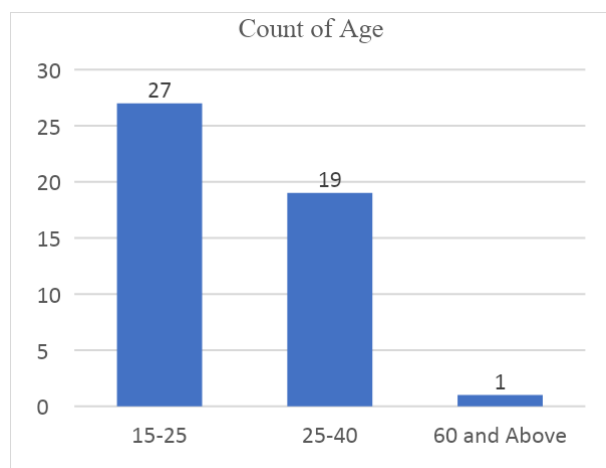
Figure 1. Count of respondent's age group

From the above table 1 and above figure 1, it is revealed that the majority of Delhi residents who attended the survey are of between the age group of 15 to 25. Followed by it, the age group 25-40 is found prevalent among the respondents who attended the survey. Finally, the respondents of age group 60 and above are found in scarce among the residents who answered the survey. The youth population is higher since, the students are concerned towards the environment rather than the middle-aged people.

Occupation

The table 2 and figure 2 describes about the frequency distribution of occupation among the forty seven respondents of study.

Table 2. Statistics and frequency distribution of occupation

Statistics		
Occupation		
N	Valid	47
	Missing	0

Figure 2. Count of respondent's occupation

From the above table 2 and above figure 2, it is revealed that the majority of Delhi residents who attended the survey are students. Next to it, the workers are in high number among the research participants. Also, the retiree persons are included as the research participant in a very low number. The students are passionate upon the environment.

Data analysis

The data collected from respondents of study is analyzed using the SPSS. The various impacts created by waste disposal practices followed by Indian people upon environment and the awareness regarding the waste disposal among the residents of Delhi, India and the influence of existing laws promoting the cleaner environment in India is assessed using various tests like one way ANOVA, correlation, regression and independent T-sampling test.

5. Results

5.1 ANOVA Test

Table 3. ANOVA – Descriptive analysis

Descriptives						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Landfilling chemicals or plastic wastes leads to the contamination of soil	yes	44	2.07	.255	.038	.99	1.15	1	2
	no	1	1.00	.	.	.	.	1	1
	may be	2	1.08	1.414	1.000	-10.71	14.71	1	3
	Total	47	1.11	.375	.055	1.00	1.22	1	3
Air pollution is caused due to incineration of waste	yes	44	1.50	.574	.087	1.19	1.54	1	3
	no	1	1.00	.	.	.	.	1	1
	may be	2	1.30	.707	.500	-4.85	7.85	1	2
	Total	47	1.36	.568	.083	1.19	1.53	1	3

The above table 3 itemises the descriptive statistics of responses of respondents for the statements such as plastic wastes or landfilling chemicals leads to soil contamination and the incineration of waste causes air pollution (dependent variable). The mean values and standard deviation values of the responses of those variables are calculated by utilizing the descriptive statistics. In addition to it, the mean values of variables plastics or landfilling chemicals leads to soil contamination and air pollution is caused due to incineration of waste are elucidated in the test. Most of the respondents reply yes for the inquired statements which states that soil pollution and land pollution is caused due to improper waste disposal, hence the response for yes is attained highest mean value of 2.07 and 1.50.

5.2 To analyze the public knowledge and awareness regarding waste disposal

Table 4. ANOVA Test – The impact of waste upon environment

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Landfilling chemicals or plastic wastes leads to the contamination of soil	Between Groups	1.673	2	.836	7.673	.020
	Within Groups	4.795	44	.109		
	Total	6.468	46			

Air pollution is caused due to incineration of waste	Between Groups	.169	2	.085	.254	.010
	Within Groups	14.682	44	.334		
	Total	14.851	46			

The above table 4 describes the significant values for the responses of respondents regarding the statements such as plastic wastes or landfilling chemicals and incineration of waste is caused by air pollution .The significance value in the Anova test is 0.020 and 0.10, with a p-value lesser than 0.05. Hence, this inference shows that there is an association among the independent variable and dependent variable. The independent variable impacts the dependent variable. This in turn proves that soil contamination and air pollution contributes to the waste generation to a greater extent. Hence, it is proved that the waste causes hazardous environment and the general public is aware regarding the ill-effects caused due to the improper waste disposal practised by oneself.

5.3   One   way   ANOVA   Test

Table 5. One way ANOVA Test- Descriptive analysis

Descriptives								
Segregation of recyclable wastes reduces the amount of waste								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
agree	41	1.50	.331	.052	1.02	1.23	1	2
neutral	6	1.00	.548	.224	.93	2.07	1	2
Total	47	1.17	.380	.055	1.06	1.28	1	2

The above table 5 enumerates the descriptive statistics for responses of respondents for the statement which states that segregation of recyclable wastes decrease the amount of waste (dependent variable). The independent variable considered in this test is recycling is the best option for WM. The mean values and standard deviation values of the responses of the variable is calculated by utilizing the descriptive statistics. In addition to it, the mean values of segregation of recyclable wastes reduces the amount of waste (dependent variable) is elucidated in the test. Most of the respondents agree to the statement of segregation of recyclable wastes reduces the amount of waste , therefore, the agree response reached the highest mean value of 1.50, which in turn proves that the recycling is best method for WM from the perception of research participants.

Table 6. The analysis of waste disposal methods

ANOVA					
Segregation of recyclable wastes reduces the amount of waste					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.748	1	.748	5.715	.021

| Within Groups | 5.890 | 45 | .131 | | |
| Total | 6.638 | 46 | | | |

The table 6 describes the significant values for the respondents reply with respect to statement of segregation of recyclable wastes decreases waste amount. The significant value obtained by means of anova test is 0.021 which means that the p-value is lesser than the 0.05 and it is found to be significant. Hence, this inference shows that segregation of recyclable waste reduces the amount of waste (dependent variable) is impacted by reusing and recycling is the best method for WM (independent variable). This analysis outcomes infers that the recycling is the best method of WM from the insight of participants of research.

5.4 Correlation test analysis

In order to describe the strength of association among the two or more variables, correlation test analysis is used. The variables like sanitation and clean water, living beings good health and well-being and clean environment are considered for correlation test analysis.

Table 7. Correlation test analysis

Correlations				
		The wastes under land should be disposed for clean water and sanitation	The wastes on land should be disposed for the living beings€™s good and health and wellbeing	The disposal of waste must be followed for clean environment
The wastes under land should be disposed for clean water and sanitation	Pearson Correlation	1	.556**	.014
	Sig. (2-tailed)		.000	.924
	N	47	47	47
The wastes on land should be disposed for the living beings good and health and wellbeing	Pearson Correlation	.556**	1	.321*
	Sig. (2-tailed)	.000		.028
	N	47	47	47
The disposal of waste must be followed for clean environment	Pearson Correlation	.014	.321*	1
	Sig. (2-tailed)	.924	.028	
	N	47	47	47
**. Correlation is significant at the 0.01 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

From the above table 7, the correlation outcomes for significant values are found out to be as 0.014, 0.000 and 0.028 for the considered dependent variables like clean water and sanitation, living beings good health and mental well-being and clean environment. The significant values are lesser than p-value which in turn indicates that there is positive relationship among the considered variables. The proper waste disposal contributes to the health and well-being of individuals. Hence, the research participants are clearly aware about the benefits of proper waste disposal method.

Table 8. Correlation test analysis

Correlations			
		GOBARdhan scheme benefited villages in effectively managing their biodegradable waste.	Jal Shakti Abhiyan helped in water conservation and water security
GOBARdhan scheme benefited villages in effectively managing their biodegradable waste.	Pearson Correlation	1	.530**
	Sig. (2-tailed)		.000
	N	47	47
Jal Shakti Abhiyan helped in water conservation and water security	Pearson Correlation	.530**	1
	Sig. (2-tailed)	.000	
	N	47	47
**. Correlation is significant at the 0.01 level (2-tailed).			

The above table 8 reveals that the correlation outcomes for significant values are 0.000 for the considered dependent variables like GOBARdhan scheme and Jal Shakti Abhiyan. This in turn reveals that there is strong association among the two variables as the p-value is found to be significant. These both schemes contributes to the welfare of nation and society in terms of water security and soil conservation from the view point of participants of research.

5.5 Regression test analysis

The regression test is used to identify association between the one dependent and one or more independent variable.

Table 9. Model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.303a	.092	.071	.238
a. Predictors: (Constant), Using 3 R's, the new wastes can be avoided				

The model summary in table 9 describes about the R, R square and adjusted R square values for the responses of respondents for the statement such as awareness regarding 3R's Reuse, Reduce and Recycle(dependent variable) and utilization of 3R's (independent variable) . The R is defined as correlation among the actual and predicted values. The R square is nothing but, the square of correlation that denotes variance proportion in dependent variable that accounts for by the constant variable in sample data. The adjusted R-Square is found out by assessing the R-Square value while employing regression equation to total populace. If the r square lies above 0.50 then, the degree of association among the variables is said to have higher and stronger correlation. Since, the R square value of the two considered variables such as awareness regarding 3R's Reuse,

Reduce and Recycle(dependent variable) and the waste can be reduced by utilizing 3R's(independent variable) is 0.092 .Hence, 92 percent of positive correlation is found among those considered variables. The high level of awareness regarding 3R's is found among the Indian people which in turn will aid to reduce the waste in upcoming days.

Table 10. ANOVA outcomes

ANOVAᵃ						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.257	1	.257	4.539	.039ᵇ
	Residual	2.551	45	.057		
	Total	2.809	46			
a. Dependent Variable: Do you aware of 3 R's "Reduce, Reuse and Recycle?						
b. Predictors: (Constant), Using 3 R's, the new wastes can be avoided						

The table 10 displays the significant value obtained from the anova test for regression is 0.039 which in turn explicates that there is a significant association among considered dependent and constant variable.

Table 11. Co-efficient table

Coefficientsᵃ						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.898	.085		10.512	.000
	Using 3 R's, the new wastes can be avoided	.126	.059	.303	2.130	.039
a. Dependent Variable: Do you aware of 3 R's"Reduce, Reuse and Recycle?						

The above table 4.11 elucidates the regression test which is utilized in this study to assess the degree of probability of the predictor variable and whether it is having effect/impact upon the dependent-variable of study. The value of significance in this regression table, seems to 0.000 and 0.039 lesser than 0.05. The outcomes, deliberates the prevalence of relationship among the predictor variable and dependent variable. The dependent variable (do you aware of 3R's) is impacted by the independent variable (Using 3R's the wastes can be reduced). When the awareness is high regarding the 3R's, the wastes can be decreased. The participants of research perceives that the concept of 3R will be useful in reducing the generation of waste.

5.6 Independent T-Sampling test

A statistical test utilized to correlate the means of various datasets to recognize the significant difference among those datasets is called as t-test. A hypothesis testing tool through which investigators inspect the

assumptions created on various populace is called as t-test in a study. There are three kinds of t-test such as paired sample T-Test, Independent Samples T-test and one Sample T-test. This research uses independent sample-test in order to find whether there is statistically significant difference among the means of 2 independent samples.

Table 12. Group Statistics

Group Statistics					
	Occupation	N	Mean	Std. Deviation	Std. Error Mean
Using 3 R's, the new wastes can be avoided	student	37	1.30	.520	.085
	worker	9	1.04	.882	.294
GOBARdhan scheme benefited villages in Effectively managing their biodegradable waste.	student	37	1.32	.475	.078
	worker	9	1.00	.000	.000

The table 11 explains about the group statistics of responses of respondents for the statements such as utilization of 3R's reduces waste and GOBARdhan scheme with regards to grouping variables. The mean differences of test variables such as Using 3 R's, the new wastes can be avoided and GOBARdhan scheme benefited villages in effectively managing their biodegradable waste varies with respect to the grouping variables (occupation). The mean differences for test variable using 3 R's the new wastes can be reduced with respect to the grouping variables (occupation) are 1.30 and 1.04. The mean difference for GOBARdhan scheme benefited villages in effectively managing their biodegradable waste (test variable) with regards to grouping variables are 1.32 and 1.00. There is statistical significant differences between the mean values for grouping variables with respect to testing variable.

Table 13. Independent Samples

Independent Samples T- test									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
								95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Using 3 R's, the new wastes can be avoided	Equal variances assumed	4.507	.039	.658	44	.014	.147	.224	.598	.304

					.481	9.395	.042	.147	.306	.835	.541
GOBARdhan scheme benefited villages in Effectively managing their biodegradable waste.	Equal variances assumed	61.127	.000	2.033	44	.048	.324	.160	.003	.646
	Equal variances not assumed			4.157	36.000	.000	.324	.078	.166	.483

The table 12 explicates the significant values of responses of respondents for statements such as using 3R's, the new wastes can be avoided(test variable) and GOBARdhan scheme benefited villages in effectively managing their biodegradable waste(test variable) which is found be statistically different with respect to the grouping variable (occupation). The significance values found out by using the independent T-samples test are 0.014, 0.042, 0.048 and 0.000. Hence, it is proved that there is a difference of opinion among the students and workers regarding the statement. Mostly, the students are aware and obsessive regarding one's environment rather than the middle-aged people.

6. Discussion

From the analysis of gathered data from respondents of study using SPSS, the inferences of the study are made. The air pollution is caused due to incineration of waste and the landfilling, plastic wastes creates contamination of soil. Hence, incineration method of waste disposal is the least preferred one for waste disposal among the participants of study. In accordance to this , an existing study(Aryan, Yadav, & Samadder, 2019) reveals that incineration process for waste disposal in the absence of energy recovery is the least desired waste disposal method since it exhibits adverse impacts upon environment. It is revealed that participants of research are clearly aware of ill-effects caused by the waste. In contrary to it, a survey conducted by conventional study(Mahajan & Sudan, 2023) reveals that the residents of Jammu city are unaware about ill-effects caused by waste disposal and not knowledgeable regarding the detrimental effects upon environment created due to improper waste disposal.

In India, around 8.8 million tonnes of plastic waste reach the water bodies for every single year. Also, the country of India dumps approximately around 0.6 million tonnes of plastic waste in rivers and oceans. Furthermore, in association to this, study(Mishra, Tiwary, Ohri, & Agnihotri, 2019) reveals that the quality of groundwater is deteriorated by means of landfills situated nearer to it. The fine quality of groundwater is converted into poor quality due to the presence of landfills positioned nearer to it. In relation to this, the present study also infers that the landfills without proper maintenance creates harmful effects to soil and environment which is mostly acknowledged by the participants of research. Moreover, the Indian government contribution and involvement is essential to receive the maximal participation of India people to achieve the clean environment with aid of proper waste disposal method. In accordance to it, the conventional study(Fernando, 2019) deliberates that if politicians ignore the significance of WMS then, it will be difficult to attain the clean and sustainable environment.

The compositing of biodegradable waste is insisted by GOBARdhan scheme for preserving soil quality and environment. In this present study, Majority of the respondents showed positive response towards the waste management schemes launched by Indian government. In accordance to the outcomes of study, the conventional study(Tiwari, 2023) infers that the enhanced and modern waste management are required for improved lifestyle of citizens. With respect to requirement of advanced WMS in India, the Swachh Bharat mission is launched by Indian government. After the launch of Swachh Bharat mission, there is a change in the behaviour of Indian people towards the WM. It is

essential for the Indian government to encounter the issues like water scarcity and facilitate the utilization of bio-fuels. The GOBARdhan scheme and Jal Shakti Abhiyan scheme launched by Indian government aids in the preservation of water, natural resources and also in the reutilizing and recycling process of waste. The Indian government of Ministry of Jal Shakti launched "Jal Shakti Abhiyan" scheme in 1st July around the year of 2019 in order to preserve the water resources(Indupriya, Kumar, & Babu, 2020).

The landfilling is the traditional method for the disposal of waste but, it may sometimes cause leachate infiltration into ground water which in turn results to secondary population especially during raining season(Kurniawan et al., 2022). The inadequate domestic waste disposal creates health impacts upon individuals like direct contact with air pollution and waste or by means of contamination. Likewise, the respondents of study are aware about the consequences of utilizing landfilling as a waste disposal technique and mostly prefer the 3R's method. It is essential to separate the non-recyclable and recyclable waste source for the effective WM. Mostly, the citizens of developed nations are conscious regarding one's consumption level meanwhile the citizens of developing nations are not so concerned about it. Hence, it is strongly recommended for the developing nation citizens to adopt the concept of reuse, reduce and recycle method for the clean and sustainable environment.

6.1 Limitations of study

Every study has its own limitation, so does the present study. The main limitation of the study is that the participants of the research are from Delhi, India. Hence, the results might lack in generalizability. However, the implication provided by the research can be useful to create the cleaner and sustainable environment.

7. Conclusion

The study analyzes the several kind of waste disposal practices implemented in India and its effect upon the environment from the perception of residents of Delhi, India. Furthermore, the study investigates the insights of residents of Delhi, India regarding the existing laws contributing to the cleaner and sustainable environment. The landfilling and incineration are the widely practised

waste disposal method in India yet, it creates adverse impacts upon society. The research participants are clearly aware about the consequences created by the improper waste disposal method. The students are loving and protective towards the one's environment when compared with the working and old-aged people. It is the responsibility of each and every citizen of a nation to dispose the waste properly and reduce the unnecessary waste production. The concept of recycling is emerging among the Indian people. The Indian government should enact laws regarding the proper waste disposal practices which will bring positive impacts upon the future environment. Hence, the forthcoming generation will free from polluted environment and will inhale the fresh air. In future, it is recommended to extend the research for developing nations in addition to India.

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