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UNDERSTANDING TEXTILE WASTE MANAGEMENT IN PUNE DISTRICT: A DESCRIPTIVE APPROACH

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ABSTRACT

The management of textile waste poses a significant challenge, especially in urban and semi-urban areas like the Pune district, due to its environmental and social implications. There is a growth in population by 30.37% each year, which is directly related to the textile waste generated each year in Pune District (Mundhe et al., 2014). Therefore, there is a need for proper waste collection and transportation routes to protect the environment from hazardous waste disposal. This study aims to examine the generation, categorization, and current management strategies for textile waste in the Pune District. Through descriptive analysis, the research seeks to identify significant trends and underlying challenges in this area. Data was collected through surveys and secondary sources, offering insights into the volume of waste generated, textile consumption, methods of disposal, the behavior of consumers towards waste and the role of the stakeholders in waste management is analyzed in this study. The development of further solutions for the waste is generated. The results reveal that the majority of textile waste remains improperly managed, contributing significantly to landfill accumulation. The exact data for textile consumption and waste is also unknown due to waste management process followed in Pune District. Additionally, awareness about recycling and sustainable waste management practices among stakeholders was found to be low, indicating a pressing need for targeted educational and infrastructural interventions. Consumer awareness for textile waste management should also be raised. Future research should concentrate on developing waste management strategies to enhance waste disposal practices. Sustainable solutions like upcycling, recycling should be used by the stakeholders to reduce the accumulation of waste.

Keywords: Consumer Behavior, Pune District, Sustainability, Textile Waste, Waste Management, Production and Consumption

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1. INTRODUCTION

The fashion industry's swift expansion has created substantial environmental issues, particularly regarding textile waste accumulation. To develop sustainable solutions, it is crucial to examine waste management approaches. There are three types of textile waste: pre-consumer, post-consumer, and industrial or production waste. The bulk of textile waste consists of materials discarded at the industrial level (such as damaged textiles and cutting remnants) and household level (worn-out clothing). In the Pune District, textile waste primarily comprises unwanted materials from households,

commercial boutiques, tailoring units, and textile companies (CHAIN, 2020). Textiles should be collected separately in municipal waste centers. The rise in urban population, along with changes in lifestyles and purchasing habits in both rural and urban populations, has contributed to increased waste generation. Reports indicate that by 2050, annual waste production will surge by 70% from 2016 levels, reaching 3.40 billion tons (Solid Waste Management: Issues and Challenges in Asia, 2007).

Presently, most municipal waste in India is disposed of using unscientific methods. In Pune city, waste primarily originates from households, businesses, hospitals, hotels, restaurants, and markets. In recent years, the fashion industry has experienced substantial growth, driven by free trade agreements between different countries. These agreements have allowed brands to produce goods in nations with lower labor costs and distribute them worldwide. The consumption and significant waste generation has increased due to the increase of fast fashion (Pensupa et al., 2017). The textile markets are directly related to the population growth, economic trends and fashion cycles. The major issues for waste management are lack of awareness, technical knowledge, legislation, policies, and strategies. Public education is necessary on segregation and disposal of solid waste through the media. To create awareness and willingness among consumers, social media platforms like Facebook, blogs, and Twitter should be used instead of brochures. Some creative approaches like redesign and upcycling rather than recycling are more effective.

The effective uses of waste are recycling, upcycling, reclamation, or refashioning. Textiles are 100% recyclable; therefore, the waste should be creatively and environmentally strived never to be discarded and dumped. Antti Martikkala's research involves the development of a system and open-source tools, with their practicality and reliability tested in real-world scenarios for waste data collection. The sourcing of textile waste is one of the major challenges. Waste segregation is a key approach that entails intentionally separating different grades of textile waste, allowing for the selection of materials to create more durable products. Here, designers and manufacturers can play an important role to divert the textile waste by reusing it. A smart way of segregation of the waste helps in minimizing the landfill load and keeps the soil, water, and air healthier The difference between financial help and behavior change shows how hard it is to promote sustainable waste management in cities (Sahu, K. T. V. Reddy; & Reddy;, n.d.). The waste can be prevented by reusing the product and making policies to improve manufacturing methods and acknowledge the consumers to promote the use and demand for greener products.

This study aims to identify the amount and sources of textile waste generated, so that the most effective and efficient waste management strategies for the Pune District can be developed. The research objectives include analyzing textile waste data from the district's 15 talukas through surveys, identifying the primary sources or areas responsible for textile waste in Pune District, and developing strategies to mitigate them. Additionally, the study will assess current waste management practices while exploring methods for recycling or repurposing textile waste. Factors affecting household characteristics such as family size, monthly earnings, social standing, educational background, residential area, and community status play a major role in environmental issues related to waste production. The data will be collected from four verticals: households, the textile industry, waste collection centers, and NGOs.

2. MATERIALS AND METHODS

2.1. STUDY AREA

Pune is an important urban center in Maharashtra and ranks eighth in terms of development nationally. The city is rapidly evolving from an educational and administrative hub to a major industrial and IT center. Located on the western edge of the Deccan Plateau, Pune is situated at an elevation of 560 meters above sea level. The Pune district spans an area of 15,637 square kilometers and is divided into five sub-divisions: Pune, Maval, Bhor, Junnar, and Baramati. The district includes 14 talukas: Pune, Velha, Bhor, Maval, Purandar, Khed, Junnar, Ambegaon, Baramati, Daund, Mulshi, Haveli, Shirur, and Indapur, along with three cantonment boards: Pune Cantonment, Khadki Cantonment, and Dehu Cantonment (CHAPTER SIX PROFILE of PUNE DISTRICT, n.d.). The population of Pune District was 9,429,408 (94.29 lakhs) in 2011, and by 2025 it is estimated to be 12,710,000 (1.27 crores) (Mahajan, 1994). The population is distributed as 39.01% rural and 60.99% urban, with an annual growth rate of 30.37%. This growth directly contributes to the increase in textile waste generated each year in Pune District. As per 2011 data, the textile industry accounted for 10.5% of industries in Maharashtra, with 6,098 micro-industries, 648 small industries, and 34 medium industries, and this number has risen in recent years.

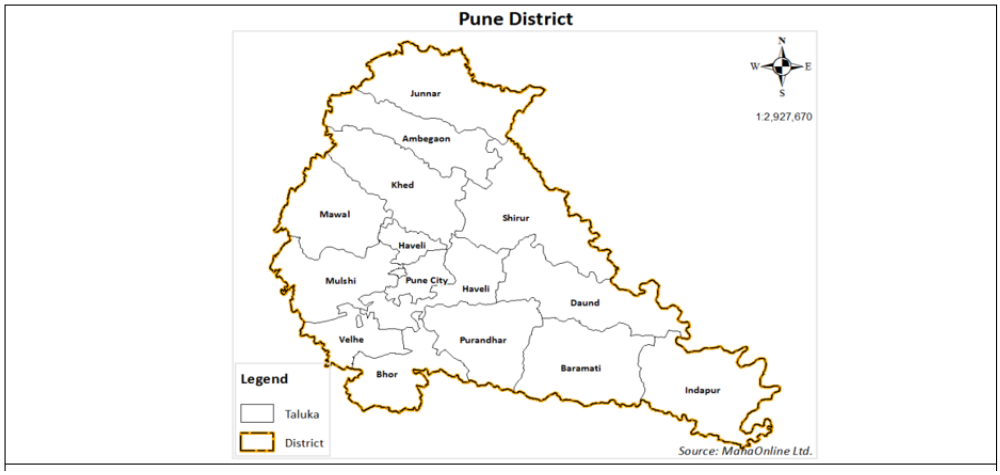

Figure 1 The geographical location of Pune District (Pune District, n.d.)

2.2. DATA COLLECTION

The first step of this study is to analyze and find out the data on textile waste in the Pune District. In this experimental research, the information on textile waste is collected by Surveys or observation techniques through questionnaires developed in four verticals- Garment/Textile industries/Tailors, NGO, Waste collection centers, and Households. Open-ended questions related to the research problems are framed in the questionnaire. The questions in the questionnaire were divided into four main topics- demographic data, consumer buying, and spending behavior, consumer behavior toward textile waste, and waste management in the locality. Few questions collecting information on demographics, purchasing patterns of respondents, their spending behaviors, approaches to managing unwanted textile items, actions taken for garments no longer in use, habits leading to textile waste creation, and details regarding waste collection and management in their locality. In addition, data is collected from various solid waste disposal sites, waste management organizations, prominent retailers, recycling companies, charitable organizations, environmental groups, industry associations, and government agencies within the Pune district. This survey will also be done to find out the reasons for textile waste and suitable solutions for the increasing waste around Pune District.

2.3. DATA ANALYSIS

The data collected from the survey and responses by questionnaire filling were recorded and analyzed using Microsoft Excel for Windows. Textile waste data from the Pune district will be examined using descriptive statistics, which are well-suited to addressing the research question. Descriptive statistics involve the use of absolute numbers to study specific variables, although they do not provide a rationale or justification for these values. Statistical measures such as mean, mode, and median are employed to summarize the data. A potential challenge in conducting this research is the limited availability of resources to comprehensively understand textile waste in the Pune district. Additionally, a lack of cooperation from respondents may hinder data collection efforts.

3. RESULTS AND DISCUSSION

3.1. FOR HOUSEHOLD/INDIVIDUAL

The survey findings reveal that 54% of respondents prefer purchasing new clothes every 3 to 6 months, with none making purchases weekly or on alternate days. Additionally, 4% purchase clothing every 15 days, 14% once a month, and 27% only on specific occasions. Regarding motivations for clothing purchases, 38% buy clothes for special occasions, 19% to keep up with market trends, 29% during sales, 14% due to boredom with existing garments, and 0% based on recommendations from friends or family. These trends indicate that the majority of respondents prioritize occasional and need-based clothing purchases rather than frequent or impulsive buying habits.

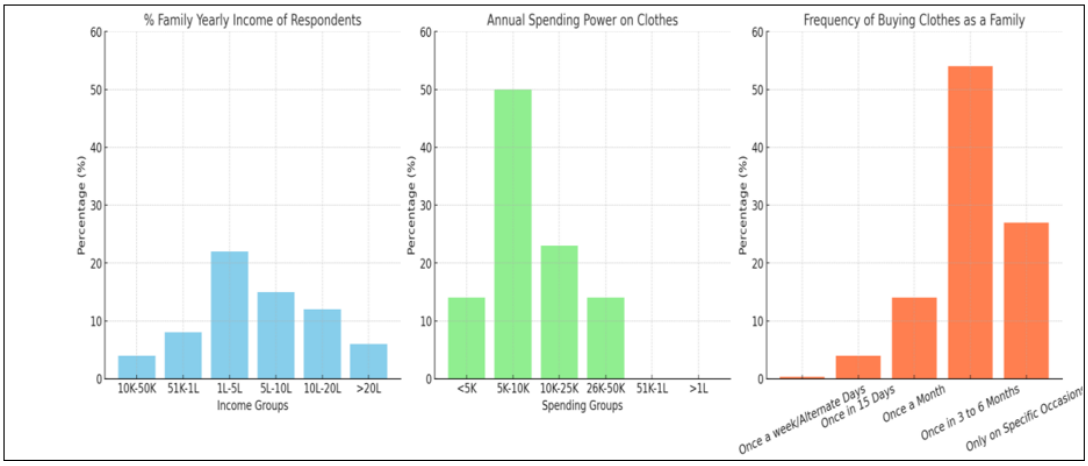

Figure 2 Graphical Representation of Spending and Buying Behaviour of Consumers as Per the Data Collection

The shopping preferences of consumers in Pune demonstrate that 27% purchase from local stores, 36% from branded shops or retail outlets in malls, 36% from online platforms such as Amazon, Meesho, and Ajio, and 6% prefer customized clothing from boutiques.

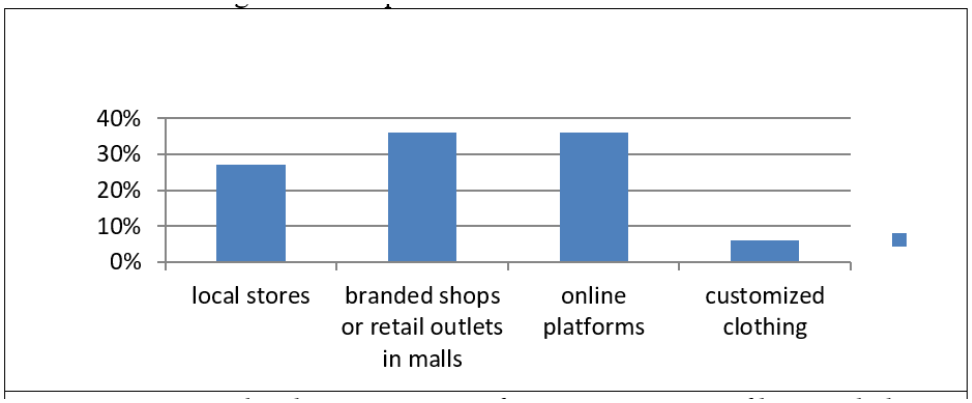

Figure 3 Graphical representation of Consumers source of buying clothes as per the data collection

The frequency of clothing disposal shows that 50.55% of respondents dispose of, donate, or discard garments on an annual basis. Regarding disposal methods, 39% donate unused garments, 23% recycle or upcycle them, 17% dispose of them as garbage, 16% burn them, and 6% sell them.

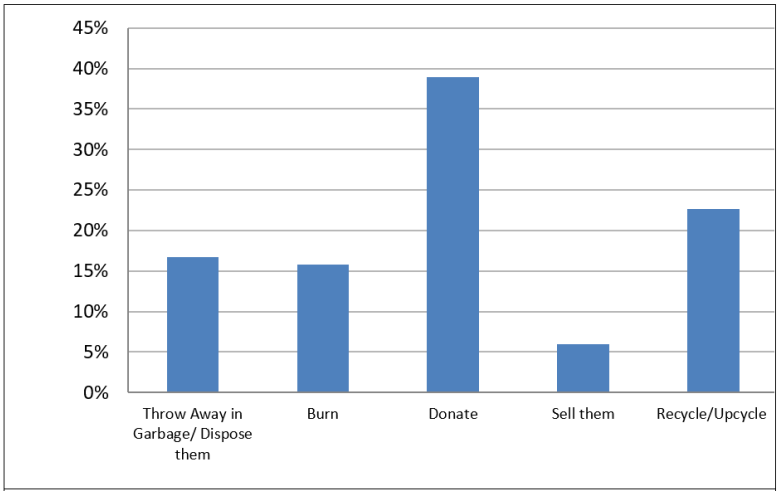

Figure 4 Graphical representation of Consumers action towards waste clothes as per the data collection.

Awareness about waste collection points is low, with 67% of respondents unaware of their existence. Moreover, there is limited knowledge about waste utilization practices, such as revenue generation or composting. A significant portion, 37% of respondents, is unaware of waste management systems in their locality. This data reflects a lack of awareness and engagement among the residents of Pune District regarding waste management practices.

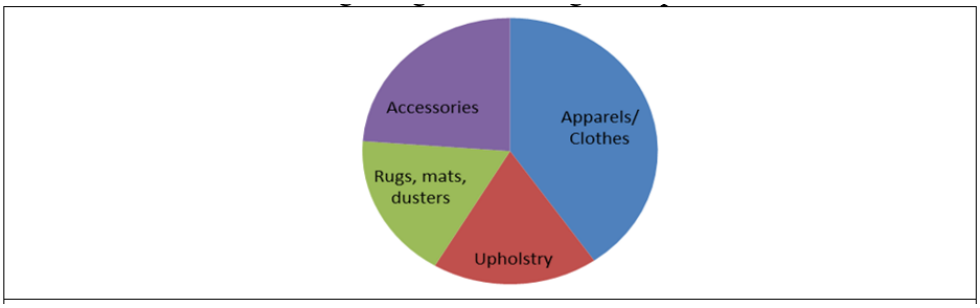

Figure 5 Graphical representation of disposed items as per the data collection.

The majority of respondents dispose of their products only when they are worn out or damaged. The reasons cited for product disposal include: worn out or damaged (46%), out of fashion or style (20%), no longer liking the item (10%), and issues related to size or other technical problems (23%).

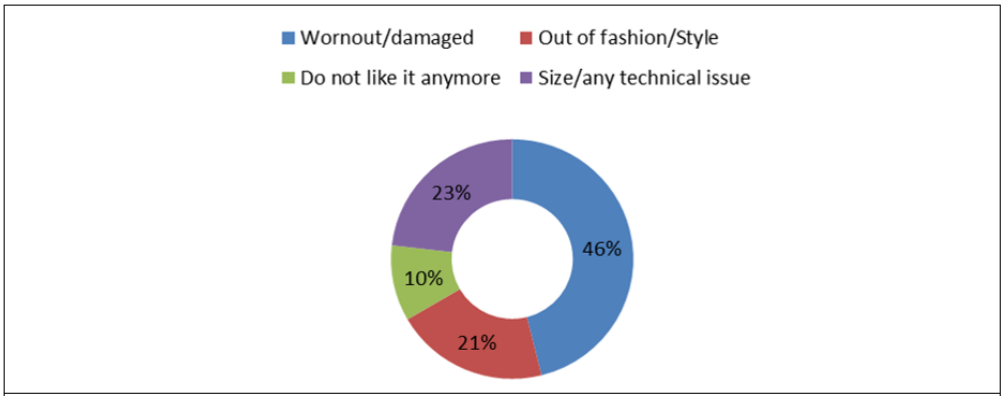

Figure 6 Graphical representation of reason for disposing as per the data collection

3.2. TEXTILE INDUSTRY/SMALL SCALE INDUSTRY/ TAILOR

In the Pune district, the majority of the area is dominated by domestic manufacturers. The composition of manufacturing units includes 1% textile manufacturing units, 19% garment or clothing manufacturing units operated by domestic manufacturers, 2% export manufacturers, 3% contractor or job-working units, 69% tailoring units, and 5% boutique units. The majority of the industry consists of tailoring units, with Baramati serving as a textile industry hub within the district. Approximately 96% of companies in Pune district focus on garment production, while fibers, yarn or thread, fabrics, household textiles or upholstery, made-up articles, and accessories account for only 1–2% of production. Regarding production capacity, 77% of manufacturing units produce fewer than 50 products per week, 16% produce 50 to 100 products, 5% produce 100 to 500 products, 1% produce 5000 to 10,000 products, and 2% produce more than 10,000 products per week.

Waste generation data indicates that 73% of units generate less than 10 kg of waste per week, 19% generate 10 to 50 kg, 5% generate 50 to 200 kg, 1% generates 200 to 500 kg, 1% generate 1000 to 5000 kg, and 1% generate 5000 to 10,000 kg of waste weekly. Fabric waste accounts for the majority (64%) of the total waste generated, followed by production waste (34%). Post-production waste and weaving or knitting waste contribute only 1% each in most talukas. Regarding waste disposal practices, 26% of units dispose of textile waste in the garbage, 32% burn it, 1% donate it, 9% sell it, and 33% recycle or upcycle it.

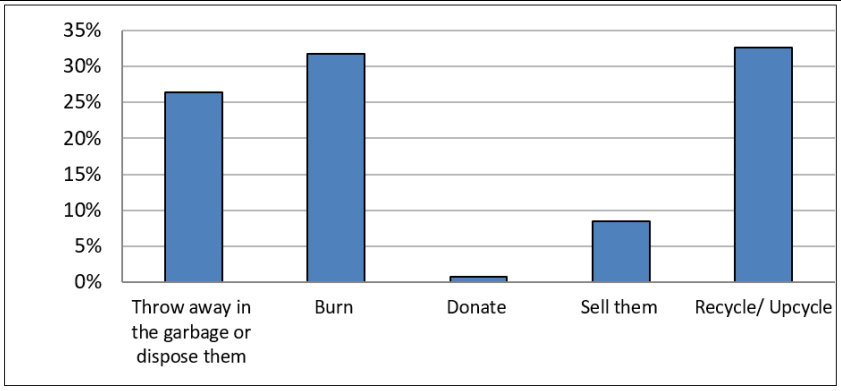

Figure 7 Graphical representation of textile waste management of textile industries as per the data collection

The information about waste collection centers or waste management practices was largely unknown to the industries. Many manufacturers and tailoring units showed little interest in understanding where their waste ultimately ends up. In rural areas, small textile waste pieces (chindis) are often repurposed for heating water or fire (shegdi) and heating the bumba. Women in these villages also make pillows, godhadi, blankets, and mattresses from the waste, thereby unknowingly upcycling the collected textile waste.

In Baramati, textile industry waste is sold to vendors based on size and color, with small cut pieces priced at 3 per kg, colored pieces at 17 per kg, and white pieces at 35 per kg. Vendors often convert white chindi into paper, although this practice has stopped post-COVID, with waste now being discarded. Most manufacturers are not interested in knowing where their waste ends up, though a few vendors either sell larger pieces or upcycle them into products like pouches, purses, covers, or use the fabric for pockets in pants or fabric buttons. If the waste is of a large enough size, it is returned to the client. In Shirur, an export manufacturing company sells production waste to vendors who recycle the material for use in other industries. Some respondents remain unaware of whether their textile waste is sold, while a few have requested greater awareness regarding textile waste recycling.

3.3. WASTE COLLECTION CENTERS

Recycling through reprocessing and reusing waste is a key initiative at the Moshi Kachra Depot. The results showed that if the waste management system is in place and effective strategy for minimizing waste generation and disposal in the locality are made, this will help reduce its negative environmental impact. The waste collected at Moshi Kachra Depot comes from various areas including PCMC, Haveli, Khadki, and Dehu, with more than 25 designated collection points. On a daily basis, 250 trips by waste collection vehicles are received at the depot. According to data collected from the waste collection center, in 2019, approximately 750 to 800 tonnes of waste were generated, while currently, the waste generation has increased to 1,100 tonnes. In terms of the source of waste, domestic (household) waste accounts for 60 to 80%, local shops contribute 10 to 30%, and NGOs, donation centers, or charitable organizations generate less than 10%.

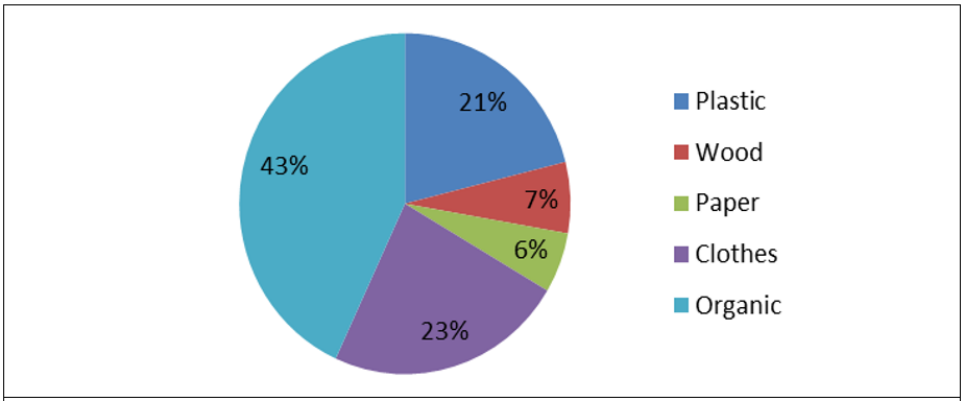

Figure 7 Graphical representation of % of waste generation of waste materials as per the data collection

Segregation is one of the crucial steps conducted in the collection center. Metals, aluminum, and coconut are separated, but textiles are difficult to separate as when received they are already mixed with other waste which is difficult to separate. Therefore the exact % of textile waste generated is difficult to assume. The waste is majorly divided into Recyclable or upcyclable goods. The recyclable waste is converted into composting. The ready compost is packed and sold to the farmers for Rs. 3/kg.

3.4. NG

Majority of the local people today, donate their clothes to NGO's. Clothes received by the NGO in good condition are cleaned, sorted, and distributed directly to economically disadvantaged communities, including slum dwellers, rural families, and disaster-affected areas. Some organizations like the Pimpri-Chinchwad Municipal Corporation (PCMC) work with waste pickers to collect old clothes, which are then used to create cloth bags. These bags are sold at low prices to reduce plastic bag usage. Additionally, stitching units have been set up to employ women, particularly those economically disadvantaged, to produce these bags. Organizations like those highlighted in Vikalp Sangam use donated fabrics to make reusable cloth sanitary pads. These are distributed to rural and tribal women while raising awareness about menstrual hygiene. Organizations like SWaCH collaborate with local waste pickers to segregate donated clothing based on usability. Clothes that cannot be reused are often repurposed into industrial rags or recycled into raw materials. This ensures minimal wastage and promotes sustainable waste management practices.

4. CONCLUSIONS

The study reveals several issues, such as people disposing of waste in open areas, the lack of treatment, and insufficient awareness and knowledge of waste management. This study is an initial step to understand the textile waste characteristics so that new strategy can be implemented for waste management in Pune.

Waste gives health hazards, harms the environment, and provides unhygienic conditions. The importance of textile waste management is providing clothes for the poor, helping save natural resources, help to connect the nation, build goodwill, social progress, and raises the economy by creating new jobs. The segregated textile waste is classified into product and waste as per its quality. From top to bottom (Most to least sustainable) the hierarchy of waste management is avoidance, reuse, recycling, recovery, and disposal. Public education for segregation and disposal of solid waste through the media is necessary for effective, efficient, and economical benefits. The municipal authorities should take initiative to create awareness among the common people and make policies to improve manufacturing methods and acknowledge consumers to promote use and demand greener products. Social media platforms like Facebook, Twitter, and blogs instead of brochures should be used. The donated garments only 20-30% is used rest all are thrown away. By 2050 the annual waste generation will increase 70% to 3.40 billion wastes. Bulk generators contribute to cost-effective and eco-friendly outcomes. A waste generator assists in sorting and storing waste separately.

CONFLICT OF INTERESTS

None.

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REFERENCES

Archana Dahiwal. (2022, August 16). Dumping your used clothes? Donate them for a green cause. PuneMirror Bureau.

Ashfaq, A., & Khatoon, A. (2014). Waste Management of Textiles: A Solution to The Environmental Pollution. Int.J.Curr.Microbiol.App.Sci, 3(7), 780–787. https://www.ijcmas.com/vol-3-7/Ahmad%20Ashfaq%20and%20Amna%20Khatoon2.pdf

Basistha, A., Prakash, N., & Sherif, R. (2024). Sorting It Out: Contribution-Action Gap in Waste Segregation in Urban India. https://docs.iza.org/dp17508.pdf

Bhattacharyya, S. (2019, February 11). Earth and Us: Ecology | climate change | Sustainability | Alternatives. Vikalp Sangam. https://vikalpsangam.org/article/sachin-asha-pad/

CHAIN, T. V. (2020, April 10). TEXTILE WASTE MANAGEMENT | Textile Magazine, Textile News, Apparel News, Fashion News. Textilevaluechain.in. https://textilevaluechain.in/in-depth-analysis/articles/textile-waste-management

CHAPTER SIX PROFILE OF PUNE DISTRICT. (n.d.). Maharashtra Industry, Trade and Investment Facilitation (MAITRI) Cell; Maha Gov. https://maitri.maharashtra.gov.in/

Chatrath, H. (2017). WASTE MANAGEMENT IN THE PIMPRI CHINCHWAD, PUNE, INDIA. Green Chemistry & Technology Letters, 3(1), 01. https://doi.org/10.18510/gctl.2017.311

Government of Maharshtra. (n.d.-a). Rural Development and Panchayat Raj. https://rdd.maharashtra.gov.in/organization/%E0%A4%AA%E0%A5%81%E0%A4%A3%E0%A5%87/

Government of Maharshtra. (n.d.-b). Rural Development and Panchayat Raj. https://rdd.maharashtra.gov.in/organization/%E0%A4%AA%E0%A5%81%E0%A4%A3%E0%A5%87/

Indian Textile Industry Merging with Waste Management Technologies. (2024). Insightssuccess.in. https://www.insightssuccess.in/indian-textile-industry-merging-with-waste-management-technologies/

JNNURM. (n.d.). Revising/Updating the City Development Plan (CDP) of Pune City - 2041. http://punecorporation.org/informpdf/CDP/Executive_Summary-Revised%20CDP.pdf

K, S. V. (2024). A Study Of Solid Waste Management In Coimbatore Corporation Tamilnadu India. Inflibnet.ac.in. http://hdl.handle.net/10603/278074

Karin M. Ekström. (2014). Waste Management and Sustainable Consumption. Google.co.in; Taylor & Francis. https://www.google.co.in/books/edition/Waste_Management_and_Sustainable_Consump/GXLfBQAAQBAJ?hl=en&gbpv=0

Khan, M. I., Wang, L., & Padhye, R. (2023). Textile waste management in Australia: A review. Resources, Conservation & Recycling Advances, 18(1), 200154. https://doi.org/10.1016/j.rcradv.2023.200154

Koch, K. (2019). Clothing Upcycling, Textile Waste and the Ethics of the Global Fashion Industry. ZoneModa Journal, 9(2), 173–184. https://doi.org/10.6092/issn.2611-0563/10053

Kunal Singha. (2020). Recycling from Waste in Fashion and Textiles. Google.co.in; Wiley Publishers. https://www.google.co.in/books/edition/Recycling_from_Waste_in_Fashion_and_Text/-pPpDwAAQBAJ?hl=en

Mahajan, R. (1994). CHAPTER IV PUNE PROFILE: AN OVERVIEW. Dgdfsgdsfg. https://www.academia.edu/42035064/CHAPTER_IV_PUNE_PROFILE_AN_OVERVIEW

Martikkala, A., Mayanti, B., Helo, P., Lobov, A., & Ituarte, I. F. (2023). Smart textile waste collection system – Dynamic route optimization with IoT. Journal of Environmental Management, 335, 117548. https://doi.org/10.1016/j.jenvman.2023.117548

Mundhe, N., Jaybhaye, R., & Dorik, B. (2014). Assessment of Municipal Solid Waste Management of Pune City using Geospatial Tools. International Journal of Computer Applications, 100(10), 24–32. https://doi.org/10.5120/17562-8184

N. R. Kokane, G. S. J., K.R. Takale, ,. (2015). Present Status of Solid Waste Management in Bhor, Pune, India: Practices and Challenges. International Journal of Innovative Research in Science, Engineering and Technology, 04(04), 2059–2064. https://doi.org/10.15680/ijirset.2015.0404035

Noufal, M., Yuanyuan, L., Maalla, Z., & Adipah, S. (2020). Determinants of Household Solid Waste Generation and Composition in Homs City, Syria. Journal of Environmental and Public Health, 2020, e7460356. https://doi.org/10.1155/2020/7460356

Pensupa, N., Leu, S.-Y., Hu, Y., Du, C., Liu, H., Jing, H., Wang, H., & Carol Sze Ki Lin. (2017). Recent Trends in Sustainable Textile Waste Recycling Methods: Current Situation and Future Prospects. Topics in Current Chemistry Collections, 375:76, 189–228. https://doi.org/10.1007/978-3-319-90653-9_7

Pune District. (n.d.). Rural Development & Panchayat Raj Department. https://rdd.maharashtra.gov.in/organization/%E0%A4%AA%E0%A5%81%E0%A4%A3%E0%A5%87/

Pune Municipal Corporation. (2006). City Development Plan 2006-2012. Pune Municipal Corporation.

Pune Municipal Corporation. (2017). Solid Waste Management Strategy Plan 2017 -2025 (Pune Municipal Corporation). https://pmc.gov.in/sites/default/files/SWM_Plan_2025_2017-PMC.pdf

Sahu, K. T. V. Reddy;, M., & Reddy;, K. T. V. (n.d.). Municipal waste management system based using IoT and YOLOv7. NTERNATIONAL CONFERENCE on INTELLIGENT TECHNOLOGIES for SUSTAINABLE ENERGY MANAGEMENT and CONTROL 2023: ITSEMC2023, 3188(1).

Solid Waste Management: Issues and Challenges in Asia (PDF 2.2MB). (2007). In Asian Productivity Organization (APO). https://www.apo-tokyo.org/publications/solid-waste-management-issues-and-challenges-in-asia-pdf-2-2mb/

Swaach Bharat Mission. (1016). INTEGRATED SOLID WASTE MANAGEMENT. MINISTRY OF URBAN DEVELOPMENT, GOVERNMENT OF INDIA.

Textiles Wastes and Recycling Options. (2020, June 28). Textile News, Views & Articles. http://textilefocus.com/10919-2/

Yacout, D. M. M., El-Kawi, M. A. A., & Hassouna, M. S. (2015). Applying Waste Management in Textile Industry: Case Study an Egyptian Plant. The Open Conference Proceedings Journal, 6(1), 35–40. https://doi.org/10.2174/2210289201506010035