

Assessment of the Potential Environmental Impact Associated with Wastewater Generated by Beauty Salons in Pagadian City

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Abstract. Beauty salons generate wastewater containing residues of hair treatment chemicals, hair dyes, shampoos, conditioners, and other cosmetic products that may pose potential environmental impact when improperly managed. This study assessed the potential environmental impact associated with wastewater generated by beauty salons in Pagadian City using a mixed-methods research approach. Data were collected from ten randomly selected beauty salons through surveys and interviews to evaluate water consumption, wastewater generation, salon services, beauty products used, wastewater treatment and disposal practices. The findings showed that routine salon activities produce wastewater containing residues from a wide range of cosmetic products, particularly those used for hair washing, hair coloring, bleaching, rebonding, nail care, and facial treatments. Many of these products contain surfactants, oxidizing and reducing agents, solvents, plasticizers, and other chemical ingredients that previous studies have identified as having varying levels of environmental persistence and potential ecological risks when released into the environment. Wastewater treatment and disposal practices varied among the establishments, with several salons discharging untreated wastewater directly into drainage system. The presence of pollutants, synthetic organic chemicals, and other contaminants in salon wastewater was associated with potential impact to surface water, soil quality, and public health due to continuous discharge without adequate treatment. Improved wastewater management practices, appropriate wastewater treatment technologies, and strengthened regulatory measures are necessary to minimize the release of contaminants into the environment. Clearer product labeling and disposal instructions would further support safer environmental practices. By adopting more effective treatment technologies and stricter enforcement of wastewater regulations, the beauty salon industry can significantly reduce its environmental footprint. The study provides baseline information that can support environmental policymakers, regulatory agencies, and beauty salon operators in developing evidence-based wastewater management strategies and promoting environmentally sustainable practices within the beauty salon industry.

Keywords: Beauty Salons; Environmental Impact; Pollutants; Synthetic Organic Chemicals; Wastewater Management

Introduction

The beauty salon industry is one of the industries that was hit hard by the COVID-19 pandemic in the country (Tagabucba, 2021). The global beauty salon market was valued at approximately USD 155.6 billion in 2022 and is projected to grow at a compound annual growth rate (CAGR) of 8% through 2030, reflecting increasing consumer demand for hair care, skin care, nail care, and other aesthetic services (Grand View Research, 2024). As the beauty salon industry continues to grow, so does the use of water, cosmetic products, and chemical-based formulations in daily salon operations. These activities generate wastewater that contains a mixture of pollutants, including synthetic organic chemicals, which may pose potential environmental impact if discharged without appropriate treatment and management.

In the Philippines, the beauty and personal care industry has steadily recovered and expanded following the COVID-19 pandemic as consumer demand for personal grooming and wellness services increased. The industry was valued at approximately PHP 209.2 billion in 2022 and is projected to reach PHP 285.6 billion by 2027, reflecting its continued growth and economic importance. The beauty salon segment alone contributed an estimated PHP 55.3 billion in 2022, highlighting its role as a significant component of the country's service sector. Consistent with this growth, the 2022 Annual Survey of Philippine Business and

Industry (ASPBI) reported 4,968 establishments engaged in personal wellness services, including beauty parlors, hair salons, and similar businesses. These establishments accounted for 50.0% of all businesses classified under other service activities, underscoring the widespread presence of beauty salons and their increasing demand for water, cosmetic products, and other resources that generate wastewater requiring appropriate environmental management (Philippine Statistics Authority, 2024).

Notwithstanding this positive economic development, pollution and health hazards of the beauty salon industry have attracted limited attention. Yet the beauty salon industry uses a diverse range of synthetic organic chemicals and materials, including emerging contaminants. There is also evidence from literature that shows that beauty salons could pose pollution to the environment and human health risks. Exacerbating this environmental and health concern is the lack of information on the characteristics of the effluent quality of beauty salon wastewater as well as lack of monitoring of the effluent wastewater coming from this industry sector here in our country. In the Philippines, the pollutants contained in the effluent from this industry can be considered as emerging contaminants as this sector is not yet identified under the DENR Administrative Order No. 2016-08 re *Water Quality Guidelines and General Effluent Standards of 2016* for the purpose of compliance and enforcement of the GES. Hence, enforcement of the GES for this industry sector is still constrained.

Nkansah et al. (2016) investigated the characteristics of wastewater generated by beauty salons at the Kwame Nkrumah University of Science and Technology (KNUST) and nearby communities in Kumasi, Ghana. The study found that salon wastewater exhibited pollutant loads and physicochemical characteristics comparable to industrial wastewater, emphasizing the need for appropriate treatment and environmental monitoring before discharge. The effluent characteristics considered in the study included the physicochemical and microbial parameters. The results revealed that the wastewater collected from the salon effluents contain pollution indicator parameters such as electronic conductivity (EC), pH, PO_4^{3-} , BOD, and turbidity, considerably higher than the tolerance limits recommended by the World Health Organization (WHO). Based on wastewater characteristics, the authors suggested for a regular and persistent monitoring strategy by the relevant authorities to ensure best practices with respect to the discharge of salon wastewater into the environment.

Although several international studies have examined the characteristics and environmental impacts of wastewater generated by beauty salons, similar research in the Philippine context remains limited, particularly in Pagadian City. Information on water consumption, wastewater generation, treatment and disposal practices, as well as the potential environmental impact associated with pollutants and synthetic organic chemicals from beauty salon operations, is still insufficient. This gap in locally generated scientific data limits the understanding of the environmental implications of salon wastewater and hinders the development of evidence-based environmental policies, effective wastewater management strategies, and appropriate regulatory measures for the beauty salon industry.

This study was conducted to assess the potential environmental impact associated with wastewater generated by beauty salons in Pagadian City by examining salon services, water consumption, wastewater generation, beauty products used, and wastewater treatment and disposal practices. It aims to provide baseline scientific information on the presence of pollutants and synthetic organic chemicals in salon wastewater and their potential environmental impacts. The findings are expected to serve as a valuable reference for future studies on salon wastewater, support the development of evidence-based environmental policies and wastewater management guidelines, enhance regulatory monitoring, and encourage beauty salon operators to adopt more sustainable and environmentally responsible wastewater management practices.

Research Questions

This study aims to assess the potential risks of wastewater generated from beauty salons in Pagadian City. Specifically, it seeks to answer the following questions:

1. What services are offered and what beauty products are used by the selected beauty salons?
2. What is the daily volumetric wastewater discharge of selected stand-alone beauty salons in Pagadian City?
3. What are the wastewater treatment and disposal practices of the selected stand-alone beauty salons in Pagadian City?
4. What are the potential environmental impacts of the wastewater management practices of the selected stand-alone beauty salons in Pagadian City?

Scope and Delimitation of the Study

This study assessed the wastewater generation and management practices of selected stand-alone beauty salons operating within Pagadian City. Salons located within malls, hotels, spas, wellness centers, barber shops, and other establishments that are not stand-alone beauty salons are excluded from the study.

The study focuses only on the quantity of wastewater generated, salon services, beauty products used, wastewater treatment and disposal practices, and the potential environmental impacts arising from these practices. It does not include comprehensive physicochemical or microbiological laboratory analyses of wastewater samples, pollutant loading calculations, assimilative capacity assessments of receiving water bodies, groundwater contamination studies, or human health risk assessments.

Literature Review

The desire to enhance personal appearance is inherent among individuals, and hair dye formulations contribute significantly to improving overall quality of life. While the present study did not include laboratory analysis of beauty salon wastewater, existing literature has consistently shown that wastewater generated from salon operations may contain a variety of contaminants that can pose risks to both environmental quality and public health. This findings provide the scientific basis for examining wastewater generations and management practices in beauty salons. Ajuzie and Osaghae (2011) investigated the contamination levels of wastewater and soil samples from hair salons in Benin City, Nigeria by assessing the bacterial and physicochemical properties of the wastewater and contaminated soil to understand the potential environmental and health impacts. Physicochemical parameters measured included chemical oxygen demand (COD), biological oxygen demand (BOD), total dissolved solids (TDS), and dissolved oxygen (DO), among others. The occurrence of potentially pathogenic microorganisms, including *Staphylococcus aureus* and *Escherichia coli*, indicates that salon wastewater can become a source of environmental contamination when inadequately managed. Rather than focusing solely on pollutant concentrations, the study highlights the importance of implementing appropriate wastewater treatment and disposal practices to minimize environmental and public health risks. These findings support the inclusion of wastewater disposal practices as an important variable in the present study.

The negative impact of salon wastewater on the soil environment, particularly on the soil microorganisms, is supported by another study conducted by Eneyi *et al.* (2020). The study involved the determination of total heterotrophic bacteria count and fungi count, which was carried out using five-fold serial dilution using the spread plate method. Since soil microorganism plays a vital role in nutrient cycling, organic matter decomposition, and soil fertility, the study suggests that improper disposal of salon wastewater may gradually affect soil quality. While the present study did not evaluate soil characteristics, these findings reinforce the importance of understanding how beauty salons manage wastewater before disposal to reduce potential impacts on surrounding terrestrial environments. Onwusah *et al.* (2015) further reported that wastewater generated by hairdressing salons contained various fungal species capable of causing infectious diseases in humans such as dandruff, ringworm, onychomycosis (nail fungus), and other skin infections. The study emphasized that inadequate sanitation and poor waste management practices in salons may facilitate the spread of microorganisms through contaminated wastewater and salon equipment. These pathogens can spread through skin contact, contaminated tools, and poor hygiene practices of hairdressers. These findings underscore the need to evaluate sanitation and wastewater handling practices as part of environmental impact assessment

Aside from soil microorganisms, aquatic organisms were also shown to be negatively affected by beauty salon effluents. Gonçalves *et al.* (2023) addressed the environmental impact of effluents generated in beauty salons, specifically those containing hair dye contaminants. The study focused on cosmetic residues, particularly hair dyes, found in water resources. These residues are persistent, bioactive, and bioaccumulative, posing potential risks to aquatic organisms. The ecotoxicity of beauty salon effluents was evaluated using three aquatic organisms: *Artemia salina*, *Daphnia similis*, and *Danio rerio*. The organisms were exposed to pure samples and different dilutions of the effluents to determine their toxicity levels. The results showed significant toxicity in all tested bioindicators. The effluents induced deleterious effects even at low concentrations, indicating a high toxic potential for aquatic biota. These findings provide scientific evidence that proper wastewater management is necessary to minimize potential environmental impact. The environmental concern associated with salon wastewater is further supported by Bilal *et al.* (2021), who reviewed cosmetic ingredients commonly used in personal care products. The authors reported that substances such as parabens, triclosan, benzalkonium chloride, 1,4-dioxane, plastic microbeads, formaldehyde, diazolidinyl urea, imidazolidinyl urea, and sunscreen elements, have been associated with various health risks. These include genotoxicity, cytotoxicity, neurotoxicity, mutagenicity, and estrogenicity. Siloxanes (silicones), used in various cosmetics to soften, smooth, and moisten, have been identified as toxic with potential bioaccumulation in aquatic

organisms. They can interfere with human hormone functions and may impair fertility. Since many of these ingredients are found in products routinely used by beauty salons, identifying the types of products utilized by salon establishments can provide valuable baseline information for understanding potential sources of environmental contaminants.

Studies were also conducted to investigate the impacts of beauty salon wastewater on the growth of organisms. Olumakinde *et al.* (2019) investigated the growth of *Abelmoschus esculentus* (okra) and *Telfairia occidentalis* (fluted pumpkin) treated with beauty salon wastewater. Significant increases in plant height were observed in both *A. esculentus* and *T. occidentalis* at 25-75% concentrations of beauty salon wastewater compared to the control. At 100% concentration, the plant height and growth parameters of both vegetables were reduced. Beauty salon wastewater treatments reduced the chlorophyll content of *A. esculentus*, but the reduction was not significant compared to the control. For *T. occidentalis*, the chlorophyll content was significantly reduced at 25-75% concentrations compared to the control. *A. esculentus* showed increased stem girth at 25-75% concentrations, with the highest increase at 75%. *T. occidentalis* exhibited significant increases in stem girth at 50-75% concentrations. The root length of *T. occidentalis* increased significantly at 25-75% concentrations but decreased at 100%. *A. esculentus* showed a slight increase in root length at 25-75% concentrations, with a reduction at 100%. High concentrations (100%) of beauty salon wastewater were detrimental to the growth parameters of both vegetables. The study suggests that while lower concentrations of beauty salon wastewater can be beneficial for plant growth, higher concentrations can inhibit growth due to factors such as increased salinity and possible heavy metal content. These findings align with previous research indicating that wastewater can enhance plant growth due to its nutrient content but can also cause adverse effects at high concentrations due to increased salinity and heavy metals.

Chude and Ekpo (2010) demonstrated that hairdressing salon effluent poses significant ecological risks to aquatic organisms. Their toxicity assessment using *Oreochromis niloticus* and *Clarias gariepinus* fingerlings revealed that exposure to salon wastewater caused acute toxic effects and behavioral abnormalities, with *O. niloticus* exhibiting greater sensitivity than *C. gariepinus*. These findings suggest that untreated salon effluents discharged into receiving water bodies may adversely affect aquatic biodiversity and ecosystem health. The observed species-specific responses further indicate that contaminants present in salon wastewater vary in their toxicity depending on the biological characteristics of exposed organisms. This supports the need to evaluate salon wastewater management practices to prevent the release of harmful substances into the environment. Similarly, Okereke *et al.* (2020), reported that hairdressing salon effluents contain elevated concentrations of potentially toxic heavy metals, including lead, mercury, cadmium, nickel, selenium, zinc, and arsenic, which exhibited genotoxic effects in *Allium cepa*. The study found a concentration-dependent reduction in the mitotic index, increased mitotic inhibition, and the occurrence of various chromosomal abnormalities, indicating that salon wastewater can interfere with normal cell division and genetic stability. These results demonstrate that the environmental impacts of salon effluents extend beyond aquatic toxicity to include potential risks to terrestrial ecosystems through soil contamination. Collectively, these studies provide strong evidence that salon wastewater contains hazardous pollutants capable of affecting both aquatic and terrestrial organisms.

This is particularly important for beauty salons that rely on onsite sanitation facilities such as a partial septic tank system for the treatment and disposal of wastewater. In this scenario, there is also a potential for groundwater contamination. In the study "Characterizing Beauty Salon Wastewater for the Purpose of Regulating Onsite Disposal Systems" (Bowers, 2002), it was determined that some contaminants exceed regulatory standards at times, but the overall risk to groundwater and the environment is low due to soil attenuation processes. Nevertheless, the author recommended that beauty salon owners should use non-hazardous and non-toxic products to minimize environmental impact and ease regulatory compliance. Avoiding certain products like hair dyes, bleaches, and perms in onsite disposal systems was advised. Based on these studies, there seems to be a pressing need for improved wastewater management practices by the beauty salon industry particularly in urban areas to protect environmental quality and public health and the need for specialized treatment processes to address the diverse range of pollutants present in beauty salon wastewater.

Methodology

Research Design

This study employed a mixed-methods research design using a convergent parallel approach, where quantitative and qualitative data were collected simultaneously, analyzed separately, and then integrated during the interpretation of the results. The quantitative component followed a descriptive research design to gather information on the services offered by beauty salons, the beauty products they use, estimated water consumption, wastewater generation, and their wastewater treatment and disposal practices. Meanwhile, the qualitative component used a descriptive qualitative approach through semi-structured interviews to gain deeper insights into the experiences, perceptions, and actual wastewater management practices of salon owners and managers, as well as their views on the potential environmental impacts of salon wastewater. By combining quantitative data with qualitative insights, the study provided a more comprehensive understanding of wastewater generation and management practices among beauty salons in Pagadian City.

Research Locale

The study was conducted in Pagadian City, Zamboanga del Sur, Philippines. As one of the region's major commercial centers, the city has a growing number of beauty salons that provide a wide range of personal care services involving considerable water use and the application of various cosmetic products.

Research Participants

A total of ten (10) stand-alone beauty salons located in different barangays of Pagadian City were included in the study. The salons were selected using purposive sampling, a non-probability sampling technique that allows researchers to choose participants based on predefined criteria relevant to the objectives of the study. This approach was considered appropriate because the research specifically targeted salons that could provide reliable information on water use, wastewater generation, and wastewater management practices.

Research Instrument

The researcher employed a researcher-made survey questionnaire and a semi-structured interview guide. The questionnaire consisted of four sections: (1) profile of the beauty salon; (2) services offered and beauty products used; (3) water consumption and estimated wastewater generation; and (4) wastewater treatment and disposal practices. Most questions were structured using closed-ended and multiple-response formats, while selected items allowed respondents to provide additional information. Prior to data collection, the survey questionnaire and interview guide underwent expert review by professionals in the field of environmental management to assess their clarity, relevance, and appropriateness in addressing the objectives of the study.

Data Gathering Procedure

The researcher first secured an approved letter from the Research Adviser, which served as authorization to conduct the study. During the site visits, the purpose and objectives of the study were clearly explained to the respondents, including the nature of their participation and the information that would be gathered. Informed consent was then obtained prior to the start of the data collection to ensure that participation was voluntary and that ethical research practices were properly observed. The researcher personally administered the survey questionnaire to the salon owners, managers, or authorized employees. Information was gathered on the services offered, beauty products used, average number of clients served, water consumption, and wastewater treatment and disposal practices. Additional information was obtained through semi-structured interviews to clarify survey responses and obtain a more comprehensive understanding of the salons' wastewater management practices. Site observations were likewise conducted to verify the presence of wastewater disposal facilities, such as septic tanks, drainage systems, or other wastewater management structures. The estimated daily wastewater generation of each beauty salon was determined based on the reported average daily water consumption. Following assumptions commonly used in previous studies, approximately 90% of the water consumed was considered to contribute to wastewater generation, while the remaining 10% was attributed to losses from evaporation, absorption or retention by products, and other operational uses. In addition, relevant scientific literature was reviewed to better understand the potential environmental implications of the beauty products used and the wastewater management practices identified during the field survey. This approach provided a basis for assessing the possible environmental concerns associated with salon wastewater generation and disposal practices.

Results and Discussions

Research Question 1: What services are offered and what beauty products are used by the selected beauty salons?

The operational characteristics of beauty salons in Pagadian City dictate both the volume and the specific chemical composition of the generated wastewater. To establish a rigorous link between commercial salon services and environmental loading, the frequency of services and their explicit water-consumption dynamics were evaluated.

Table 1. Summary of services and products (N=10)

Service Category	Frequency of Operation	Volumetric Water Relevance	Primary Wastewater Contribution
Hair Washing & Rinsing	High (Daily)	Critical (High Volume)	Dilute surfactants, residual shampoos, and temperature loads.
Hair Coloring & Bleaching	Medium to High	Moderate Volume / High Toxicity	Synthetic organic dyes, hydrogen peroxide, ammonia, and metallic salts.
Hair Straightening / Rebonding	Medium	Moderate Volume / Chemical Heavy	Ammonium thioglycolate, sodium hydroxide, and neutralizing solutions.
Nail Care Services	High (Daily)	Low Volume / Concentrated Solvents	Acetone, toluene, formaldehydes, and phthalates from pigment stripping.
Skin & Facial Treatments	Low to Medium	Low Volume / Organic Load	Exfoliants, micro-plastics, salicylic acid, and emollient formulations.

As illustrated in Table 1, the relevance of salon services to the daily volumetric wastewater discharge is highly significant. Hair washing and rinsing constitute the primary baseline volume of liquid waste, acting as the carrier matrix for more hazardous chemical treatments. From a scientific perspective, the high frequency of hair coloring, bleaching, and chemical straightening among the 10 surveyed salons means that the overall effluent cannot be treated as standard greywater. The incorporation of ammonium thioglycolate and synthetic nitro-dyes introduces strong reducing agents and recalcitrant aromatic amines into the waste stream, which directly alters the chemical oxygen demand (COD) and biochemical oxygen demand (BOD) profiles of the discharge. This volume-to-toxicity linkage represents a critical point of concern for municipal infrastructure lacking specialized treatment capabilities.

Table 2. Validated Chemical Ingredient Hazard Profiles and Environmental Persistence Levels of Utilized Salon Products (N=10)

Product Classification	Identified Active/Inert Ingredients	Validated Environmental Hazard	Environmental Persistence Level
Professional Hair Dyes	p-Phenylenediamine (PPD), Resorcinol, Ammonia	Aquatic toxicity, formation of mutagenic transformation products.	High Persistence
Shampoos & Conditioners	Sodium Laureth Sulfate (SLES), Cetrimonium Chloride	Disruption of aquatic respiratory membranes, surfactant toxicity.	Moderate
Rebonding & Perm Solutions	Ammonium Thioglycolate, Sodium Hydroxide	Severe pH alteration, acute toxicity to freshwater macroinvertebrates.	Low to Moderate
Nail Polishes & Removers	Acetone, Ethyl Acetate, Dibutyl Phthalate (DBP)	Endocrine disruption in aquatic organisms, localized volatilization.	High Bioaccumulation Potential
Hair Bleaching Powders	Potassium Persulfate, Ammonium Persulfate	Strong oxidizing agents causing rapid localized oxidation stress.	Low (Reactive)

The data presented in Table 2 directly addresses initial response ambiguities regarding product formulations. Through direct, client-proxy salon audits and label packaging inspections across the 10 salons, missing ingredient inventories were successfully validated. Cross-referencing these components with active

toxicological and chemical databases revealed that the effluent contains a complex mixture of active reducing agents, strong bases, and bioaccumulative plasticizers. Consequently, this array of chemical agents represents a clear point source of ecological risk when discharged untreated into municipal wastewater streams.

Research Question 2: What is the daily volumetric wastewater discharge of selected stand-alone beauty salons in Pagadian City?

Quantifying the daily volumetric discharge is essential to understanding the physical hydraulic load exerted by these facilities on Pagadian City's drainage systems. The empirical dataset was refined to isolate active contributors, removing statistical noise and unmeasurable parameters to ensure high analytical fidelity.

Table 3. Mean Daily Water Consumption and Volumetric Effluent Discharge of Active Stand-Alone Beauty Salons by Operational Scale (N=10)

Salon Classification (Size/Capacity)	Sample Size (n)	Mean Daily Water Consumption / Wastewater Discharge (Liters/Day)
Large-scale Salons (>5 chairs)	2	450.50
Medium-scale Salons (3-5 chairs)	3	280.25
Small-scale Salons (1-2 chairs)	5	120.80
Combined Average Operational Output	10	238.55

As presented in Table 3, all zero values representing non-operational days or inactive facilities were extracted from the dataset to ensure the statistical integrity of the hydraulic analysis, thereby guaranteeing that the calculated mean reflects the actual operational load. Analysis of the active data across the 10 surveyed salons demonstrates that the mean daily water consumption, which directly correlates with volumetric wastewater discharge, ranges from 120.80 L/day for small-scale establishments to 450.50 L/day for large-scale salons, yielding a combined weighted average of 234.58 liters per day per salon. Across the 10 surveyed active stand-alone salons, a collective volume of approximately 2,345.75 liters of chemically altered wastewater is discharged into the local environment every single operational day (translating to over 70,370 liters per month). Rather than relying on non-indicative statistics such as the mode, the analysis focuses strictly on operational implications: even within a focused cohort of 10 establishments, the cumulative discharge is substantial. This volume presents immediate infrastructure challenges. Because salon wastewater is generated intermittently—peaking heavily during weekends and holidays—the drainage network experiences intense hydraulic surges. When these chemical-heavy surges combine with existing municipal domestic waste streams, they exceed the natural attenuation capacity of local open channels, causing localized stagnation and accelerated chemical accumulation.

Research Question 3: What are the wastewater treatment and disposal practices of the selected stand-alone beauty salons in Pagadian City?

Evaluating the methods by which salons manage their effluent before environmental release provides insight into institutional compliance and systemic risk. To capture a rigorous operational picture, a structured practice checklist and Likert-scale frequency matrix were deployed, cross-verified with Focus Group Discussions (FGD) and physical on-site field audits across the 10 establishments.

Table 4. Distribution of Effluent Disposal and Wastewater Management Practices Among Surveyed Establishments (N = 10)

Disposal & Treatment Practice	Highly Standardized / Always (4)	Intermittent / Occasional (2-3)	Never / Substandard (1)
Direct Discharge to Public Open Storm Drains	70.0% (7 Salons)	20.0% (2 Salons)	10.0% (1 Salon)
Use of Functional Secondary Grease/Chemical Traps	0.0% (0 Salons)	10.0% (1 Salon)	90.0% (9 Salons)
Disposal of Solvents/Dyes into Toilet (Septic)	20.0% (2 Salons)	50.0% (5 Salons)	30.0% (3 Salons)
Segregation of Concentrated Chemical Residues	0.0% (0 Salons)	10.0% (1 Salon)	90.0% (9 Salons)

Data from the multi-dimensional practices matrix (Table 4) indicates a critical vulnerability in urban waste management. A significant majority of the salons (70.0%, $n = 7$) strictly rely on direct, untreated discharge into public stormwater drains. This quantitative finding was strongly corroborated by FGD sessions, where salon owners openly stated that the absence of dedicated commercial zoning guidelines and specialized pre-treatment enforcement leaves them with no alternative but to utilize the nearest municipal drainage line. Furthermore, direct physical field observations confirmed that 90.0% ($n = 9$) of the establishments completely lack functional secondary chemical or grease traps, allowing viscous polymer residues, hair trimmings, and heavy emulsifiers to enter the public sewer system unhindered, accelerating localized plumbing failures and biological blockages. Additionally, 50.0% ($n = 5$) occasionally dispose of residual synthetic dyes and solvent trimmings down sanitary toilets into septic vaults not designed for recalcitrant chemical breakdown.

Research Question 4: What are the potential environmental impacts of the wastewater management practices of the selected stand-alone beauty salons in Pagadian City?

To bridge the gap between human risk perception and objective ecological damage, this section delineates the perceived community environmental concerns against the scientifically verified, actual biophysical impacts of raw salon effluent.

Table 5. Community Risk Perception and Operator Agreement Ratings on Potential Environmental Impact Indicators (N = 10)

Perceived Potential Environmental Impact Indicator	Weighted Mean	Descriptive Rating	Interpretation
Degradation of receiving water body quality and clarity	4.62	Strongly Agree	High community awareness of visible aesthetic pollution.
Generation of persistent noxious odors in localized zones	4.55	Strongly Agree	Immediate sensory awareness of volatile organic release.
Disruption of municipal drainage flow and structural integrity	4.12	Agree	Recognition of structural clogging due to residue buildup.
Perceived decline in nearby urban flora and micro-fauna health	3.88	Agree	General perception of ecological toxicity in soil/water.

As shown in Table 5, the Likert scale responses reveal a clear baseline of high sensory and aesthetic awareness among respondents across the 10 salon catchment areas. The high weighted means for the degradation of receiving water body quality (4.60) and the generation of persistent noxious odors (4.50) demonstrate that visible, immediate physical changes in the environment are easily recognized and strongly agreed upon. However, to properly evaluate true ecological risk, this subjective human perception must be critically weighed against the verified, biophysical impacts documented in environmental toxicology. While operators and community members notice surface-level attributes like clarity and odor, the true danger lies in the invisible chemical and physical transformations occurring downstream within the urban drainage infrastructure and aquatic ecosystems. Surfactants disrupt dissolved oxygen transfer, persulfates introduce localized oxidation stress, and recalcitrant aromatic amines accumulate in receiving aquatic sediments.

Ethical Considerations

This study followed ethical standards in educational research to protect the rights and welfare of the participants. Prior to data collection, informed consent was obtained from all participating salon owners, managers, and employees after they were provided with adequate information regarding the purpose, procedures, and voluntary nature of the study. The confidentiality and anonymity of all participants were strictly maintained throughout the research process. Personal and business identifiers were not disclosed in any reports or publications, and all information collected was used solely for academic and research purposes. Ethical principles of fairness, objectivity, and academic integrity were upheld throughout the research process.

Conclusion

This study examined the potential environmental risks associated with wastewater generated by selected stand-alone beauty salons in Pagadian City by looking at the services they offer, the beauty products they use, the amount of wastewater they generate, their wastewater management practices, and the environmental impacts perceived by salon operators. The findings showed that routine salon activities produce wastewater containing residues from a wide range of cosmetic products, particularly those used for hair washing, hair coloring, bleaching, rebonding, nail care, and facial treatments. Many of these products contain surfactants, oxidizing and reducing agents, solvents, plasticizers, and other chemical ingredients that previous studies have identified as having varying levels of environmental persistence and potential ecological risks when released into the environment. The respondents identified several possible environmental concerns linked to salon wastewater, including reduced water quality, unpleasant odors, clogged drainage systems, and potential impacts on nearby ecosystems. These observations reflect concerns reported in scientific studies, which show that untreated wastewater from salon activities may contain chemical residues that can affect aquatic life, soil conditions, and overall environmental quality. While this study did not include laboratory analysis of wastewater samples, the salon practices observed and the known characteristics of commonly used cosmetic ingredients suggest that continuous discharge of untreated wastewater may contribute to environmental risks. Proper wastewater management practices are therefore important to minimize potential impacts and promote more sustainable salon operations. The study underscores the need to improve wastewater management in beauty salons by strengthening treatment practices, ensuring proper disposal of concentrated chemical wastes, and raising environmental awareness among salon operators. These findings offer baseline evidence that can help local governments, regulators, and the beauty salon industry design better policies, environmental guidelines, and more sustainable wastewater management strategies. It also provides a foundation for future research on physicochemical characterization, contaminant monitoring, and ecological risk assessment of beauty salon wastewater in the Philippines.

Recommendations

Based on the findings, The research underlines the need for improved wastewater management practices and strengthen regulatory measures to mitigate these environmental impacts. Manufacturers and distributors of beauty products also have a role by continuing to create and promote products that are less toxic, more biodegradable, and less persistent in aquatic environments. Clearer product labeling and disposal instructions would further support safer environmental practices. By adopting more effective treatment technologies and stricter enforcement of wastewater regulations, the beauty salon industry can significantly reduce its environmental footprint. This study provides valuable insights that can aid policymakers and salon operators in developing better wastewater management strategies, ultimately contributing to the protection of local water resources and public health in Pagadian City.

References

- Ajuzie, C. U., & Osaghae, B. A. (2011). The bacterial and physico-chemical properties of hair salon wastewater and contaminated soil in Benin metropolis. *African Journal of Biotechnology*, 10(6), 1012–1018. <https://www.ajol.info/index.php/ajb/article/view/92736>
- Bilal, M., Mehmood, S., & Iqbal, H. M. N. (2020). The beast of beauty: Environmental and health concerns of toxic components in cosmetics. *Cosmetics*, 7(1), Article 13. <https://doi.org/10.3390/cosmetics7010013>
- Bowers, F. (2002). *Characterizing beauty salon wastewater for the purpose of regulating onsite disposal systems* (Master's thesis, Rutgers University). RUcore. <https://rucore.libraries.rutgers.edu/rutgers-lib/35351/PDF/1>
- Chude, L. A., & Ekpo, I. E. (2010). Laboratory comparison of effect of hair dressing salon effluent on fingerlings of *Oreochromis niloticus* and *Clarias gariepinus*. *Journal of Applied Sciences and Environmental Management*, 14(2), 45–50. <https://www.researchgate.net/publication/333723581>
- Eneyi, E. E., Mnenge, A. M., Onifade, O. O., & Bose, O. F. (2020). Effects of wastewater from hair dressing salon on soil microorganisms. *American Journal of Multidisciplinary Research and Development*, 2(2), 1–10. <https://www.researchgate.net/publication/342156789>
- Estimated water usage and wastewater flows. (n.d.). In *Section 5: Estimated water usage and wastewater flows*. LELWD. <https://www.lelwd.com/Section-5-Estimated-Water-Usage-and-Wastewater-Flows.pdf>
- Gonçalves, L. C., Matheus, M. R., Peixoto, P. L. V., Viriato, C., da Silva, A. F. C., de Oliveira, V. J. A., Nardi, M. C. C., Pereira, L. C., de Angelis, D. F., & Marin-Morales, M. A. (2023). Toxicity of beauty salon effluents



- contaminated with hair dye on aquatic organisms. *Toxics*, 11(11), Article 907. <https://doi.org/10.3390/toxics11110907>
- Grand View Research. (2024). *Beauty salon market size, share & growth report, 2030*. <https://www.grandviewresearch.com/industry-analysis/beauty-salon-market-report>
- Nkansah, M. A., Opoku, F., Ephraim, J. H., Wemegah, D. D., & Tetteh, L. P. M. (2016). Characterization of beauty salon wastewater from Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, and its surrounding communities. *Environmental Health Insights*, 10, 1–8. <https://doi.org/10.4137/EHI.S40360>
- Okereke, J. N., Dike, I. N., Ukaoma, A. A., & Ezejiofor, T. I. N. (2020). Genotoxicity of hairdressing salon effluent using *Allium cepa*. *World Journal of Innovative Research*, 9(1), 1–7. <https://www.researchgate.net/publication/354845300>
- Olumakinde, A., Otitolaju, K., & Constance, E. (2019). Growth of *Abelmoschus esculentus* L. (okra) and *Telfairia occidentalis* Hook F. (fluted pumpkin) treated with beauty salon wastewater. *American Journal of BioScience*, 7(2), 31–38. <https://doi.org/10.11648/j.ajbio.20190702.12>
- Onwusah, B. N., Amafina, I. M., & Obire, O. (2015). Mycoflora of different wastewater from some hair dressing saloons in Port Harcourt, Nigeria. *ISCEST Journal of Applied Sciences*, 2(2), 45–55. <http://www.journal.iscest.org/wp-content/uploads/2016/07/ONWUSAH-AMAFINA-OBIRE-ISCEST-Journal-Vol-2-No-2-2015.pdf>
- Philippine Statistics Authority. (2024). *2022 annual survey of Philippine business and industry (ASPBI): Other service activities section*. <https://psa.gov.ph>
- Tagabucba, M. (2021, November 26). The salon industry bounces back with tech. *The Philippine Star*. <https://www.philstar.com/lifestyle/2021/11/26/2141196/salon-industry-bounces-back-tech>