KESANS: International Journal of Health and Science
2808-7178 / 2808-7380
http://kesans.rifainstitute.com/index.php/kesans/index

Sustainable Waste Management Strategy for Batik MSMEs in Jambi City

Emy Sartika, Anis Tatik Maryani, Hutwan Syarifuddin
Master of Environmental Science Study Program, Universitas Jambi, Indonesia
sartikaemy@gmail.com

Article Information
Submitted: **18 October 2025**
Accepted: **24 October 2025**
Publish: **31 October 2025**

Keyword: Industrial Waste Management Strategy; MSMEs; Sustainable Batik; AHP;

Abstract
Introduction: *The batik industry is a vital part of the creative economy, contributing to increased incomes. However, its production activities also have the potential to cause environmental pollution due to suboptimal waste management.* ***Objective:*** *This study aims to analyze the influencing factors and formulate a strategy for sustainable waste management for batik MSMEs in Jambi City.* ***Methods :*** *using the Analytical Hierarchy Process (AHP) involving 25 respondents consisting of batik craftsmen, government, and community leaders.* ***Results and Discussion:*** *Social factors had the greatest influence (0.362), followed by economic factors (0.268), environmental factors (0.240), and institutional factors (0.130). The main priority sub-criteria were supervision and monitoring (0.616), knowledge (0.510), and waste processing costs (0.481). The most prioritized alternative strategy was the application of natural and environmentally friendly dye technology (0.549), followed by community-based communal wastewater treatment plants (0.228), and multi-party collaborative partnerships (Pentahelix) (0.224).* ***Conclusion:*** *The success of sustainable batik waste management requires synergy between the government, the community, and business actors through a green technology approach and participatory governance*

How to Cite **Emy Sartika, Anis Tatik Maryani, Hutwan Syarifuddin/Sustainable Waste Management Strategy for Batik MSMEs in Jambi City, Vol. 5, No. 1, 2025**
DOI https://doi.org/10.54543/kesans.v5i1.473
e-ISSN/p-ISSN **2808-7178 / 2808-7380**
Published by **CV Rifainstitut/KESANS: International Journal of Health and Science**

Introduction

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of the national economy and the primary source of livelihood for most Indonesians. Their role is vital, especially since the majority of the population still has relatively low levels of education and is predominantly active in the informal sector, including in creative industries such as batik, both traditional and modern. (Ramadhan et al., 2020). The batik industry in Indonesia is generally a Micro, Small, and Medium Industry (IMKM) or Micro, Small, and Medium Enterprises (MSMEs). This is indicated by data from the Center for Crafts and Batik (BBKB) of the Ministry of Industry; there are approximately 3,159 batik businesses throughout Indonesia as of 2021. Of these, 208 are large- and medium-scale batik businesses, while 2,951 are micro, small, and medium-scale batik businesses. Micro-scale batik businesses dominate with 1,794 units, followed by small businesses with 815 units, and medium businesses with 342 units. (Ahdiat, 2022).

Jambi City is one of the regions that has experienced significant development in the batik industry. Jambi batik with its distinctive patterns and motifs not only reflects local cultural identity but also becomes part of the potential creative economy sector. In Jambi City, the batik industry is growing rapidly and is spread across various sub-districts in the form of household-scale businesses. Based on data from the Jambi City Department of Industry and Trade, in 2023 there were 104 batik business units, and in 2024 this increased to 114 units. The increase in batik production in Jambi City is driven by high public demand for batik cloth, both for formal needs, ceremonial activities, and cultural expressions in various events.(Kementrian Perindustrian, 2020).

Despite showing growth, the rapid development of the batik industry in Jambi City is not matched by adequate waste management capabilities. Based on initial observations and data from the Jambi City Environmental Agency, most batik MSMEs in the area do not yet have Wastewater Treatment Plants (WWTP) that meet environmental standards. Limited technological understanding, limited funding, and a lack of attention to environmental aspects are the main factors that hinder the implementation of effective and sustainable waste management systems. This presents a challenge in efforts to maintain long-term environmental quality (Hariadi, 2021). The use of non-biodegradable synthetic dyes in the batik-making process produces wastewater containing Zn, Cr, and other environmentally harmful heavy metals, as well as BOD, COD, TSS, pH, and color. Therefore, treatment is necessary before disposal into the environment (Hastutiningrum et al., 2017).

Based on research conducted Purwaningrum et al (2023), There are 13 batik SMEs in Ulu Gedong Village. These SMEs are in RT01, RT02, RT03, RT05, RT07, RT08, and RT09. Wastewater generated from the batik production process in each SME is not processed according to technical standards, but is instead discharged directly into the environment, namely the ground surface and water bodies such as creeks and drainage channels. Based on research conducted by (Purwaningrum et al., 2023) The concentrations of BOD, COD, and TSS did not meet the quality standards for textile industrial wastewater (Minister of Environment Regulation No. 05 of 2014). The concentrations of BOD, COD, and TSS were 324 mg/l, 775 mg/l, and 193 mg/l, respectively. Based on previous research conducted by (Dewi, 2022) also demonstrated environmental pollution caused by batik industry wastewater in Ulu Gedong Village, Danau Teluk District, Jambi City. Based on field monitoring and batik production data in Ulu Gedong Village, Danau Teluk District, there are 10 batik businesses spread across 9 neighborhood associations (RT) actively producing Jambi batik using traditional

techniques. These 10 productive artisans produce an average of 250 to 3,000 pieces of batik per month.

The Jambi city government has not focused its regulations and policies on batik industry wastewater issues, resulting in a significant negative impact on the environment. Wastewater is simply dumped onto the ground, in holes, wells, and rivers. This waste can damage the landscape and pollute soil, groundwater, and surface water (Purwaningrum et al, 2023). The Jambi City Environmental Agency has taken several steps to address batik waste in Jambi City. Social control is carried out by involving community leaders to provide moral messages or outreach to batik MSMEs and provide education about environmentally friendly batik. Furthermore, the Jambi City Environmental Agency is taking repressive/control measures to prevent further worsening of the batik wastewater pollution problem. These measures include the construction of a communal-scale wastewater treatment plant (IPAL). The Jambi City Government and Bank Indonesia have built an IPAL in Jelmu Village, Pelayangan District, which has a capacity of 10 Batik SMEs. However, due to the large amount of funds and the difficulty of the technology used for its operation and maintenance, the communal IPAL has not been able to be maximized (Purwaningrum et al, 2023)

In response to these problems, it is necessary to formulate a strategy to manage batik industrial waste sustainably, requiring a strategy that not only considers technical aspects, but also social, economic, and institutional aspects of the conditions of local MSMEs. Therefore, an approach is needed that can identify and prioritize key factors in waste management decision making in Jambi City by using the Analytical Hierarchy Process (AHP) method as a relevant analytical tool to determine the best strategy systematically. The formulation of this strategy also refers to the applicable regulations, namely Jambi City Regional Regulation Number 7 of 2017 concerning Management and Control of Hazardous and Toxic Waste (B3) as a legal framework that underlies the control of the impact of industrial waste on the environment.

Method

This research is a quantitative analysis and interview study of 25 people which aims to capture a value or view represented by government elements, batik entrepreneurs and community leaders regarding the management of batik liquid waste. Using the Analytical Hierarchy Process (AHP) method, which is an approach used based on policy analysis that aims to find alternatives for sustainable batik MSME industrial waste management. Sampling uses a purposive sampling technique where the number of respondents in this study consisted of 25 people, namely 16 Batik craftsmen, 6 people from government elements and 3 Community Leaders, with competent considerations. The requirements for valid respondents in AHP are that they are people who master or are experts in their fields. This research is in Jambi City which has Batik MSMEs, namely consisting of 5 locations, namely: Jambi Zhorif Batik, Ulu Gedong Village, Al-Fath Batik, Tanjung Pinang Village, Jambi Berkah Batik, Pematang Sulur Village, Jambi Ariny Batik, Pasir Panjang Village, and Jambi Dira Batik, Buluran Kenali Village.

Results and Discussion

Criteria for Sustainable Batik MSME Industrial Waste Management

The criteria aim to assess the level of influence of a second-level factor element on the primary objective, sustainable batik MSME industrial waste management. The weights and priorities of the second-level factors are shown in Table 1 below:

Table 1
Weighting of Environmental Criteria for Sustainable Batik MSME Industrial Waste Management

Criteria	Weight	Percentage (%)
Environment	0.240	24
Economy	0.266	27
Social	0.364	36
Institutional	0.130	13

To see the weighting of factors and their influence on the management of sustainable batik MSME industrial waste in a graph, see Figure 1.

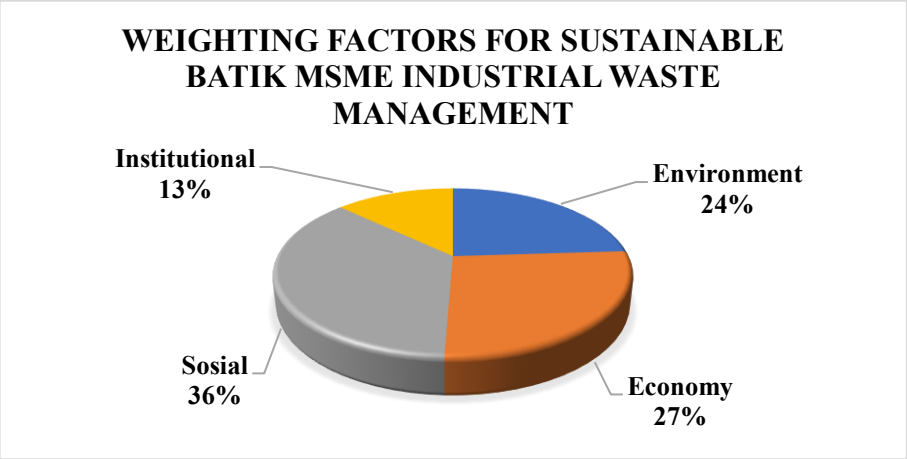

Figure 1 Priority Criteria for Sustainable Batik MSME Industrial Waste Management

Based on the results of data processing in Table 1 and Figure 1, the priority factor that has the greatest level of influence in the management of industrial waste of Sustainable Batik MSMEs in Jambi City is the Social Factor with a weighting value of 36%. The next factors that also influence the Batik Industrial Waste Management Strategy in Jambi City in sequence are Economic 27%, Environmental 24%, and Institutional 13%. The first factor element that influences the management of industrial waste of Sustainable Batik MSMEs in Jambi City is social, this factor illustrates that cooperation between the Jambi City Environmental Service and the community to overcome the problem of batik waste (Mahfudhloh & Lestari, 2022).

The social factors referred to are participation, knowledge, perception, and occupational health, which significantly influence communities in the batik MSME industry to use environmentally friendly dyes. Education about environmentally friendly batik, using natural dyes, will result in environmentally friendly waste, so that the waste from batik production that is discarded will not cause harmful environmental pollution. This means that good social interaction between the community and the environment will foster a perception of the importance of industrial waste management. The second factor influencing the waste management of the Sustainable Batik MSME industry in Jambi City is the economy, with a weighting of 27%. The ongoing application of the linear economic concept has consequences for environmental degradation and overconsumption of scarce resources, thus requiring cost-effective waste management. Government support is crucial for optimizing the processing and recycling of batik waste. (Sabrina

Hartianingrum & Yuadi, 2024). The government can provide incentives for the batik industry to implement responsible waste management practices. Furthermore, the government can provide technical assistance and training to MSMEs recycling batik cloth. (Hardani, 2024)

The third factor influencing the waste management of the Sustainable Batik MSME industry in Jambi City is the environment, with a weighting of 24%. Proper waste management will prevent environmental pollution and maintain environmental capacity by preserving natural resources and utilizing them as effectively as possible. (Mahfudhloh & Lestari, 2022). Fourth factor element The third factor element that influences the management of industrial waste of Sustainable Batik MSMEs in Jambi City is institutions with a weighting value of 13%. Institutions in the form of the availability of supporting regulations, institutional capacity and the existence of supervision and monitoring are part of good governance for the management of industrial waste of Sustainable Batik MSMEs in Jambi City. Good governance as formulated by the Indonesian Center for Environmental Law (ICEL) requires five things, namely: (1) Representative institutions that are able to carry out the function of control and channeling community aspirations, (2) Bureaucracy or regulations that are responsive to community needs and have integrity, (3) Strong civil society that is able to carry out control functions, (4) Decentralization and strong representative institutions (Kurniawan et al., 2020).

Sub-Criteria for Sustainable Waste Management in the Batik MSME Industry

The sub-criteria aim to assess the level of influence of an element on the selected sub-criteria. The weights and priorities of the sub-criteria elements in environmental, economic, social, and institutional contexts are shown in Table 2 below:

Table 2
Weighting of Environmental Sub-Criteria for Sustainable Batik MSME Industrial Waste Management

Environmental Sub-criteria	Weight	Percentage (%)
Environmental Carrying Capacity	0.153	20
Pollution Reduction	0.215	29
Waste Management	0.382	51

To see the weighting of factors and their influence on the management of sustainable batik MSME industrial waste in a graph, see Figure 2.

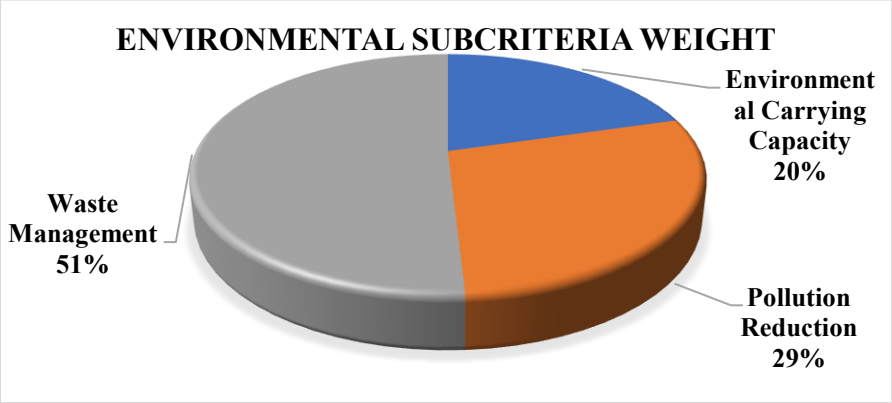

Figure 2 Priority of Environmental Sub-Criteria for Sustainable Management of Batik MSME Industrial Waste

Based on the results of data processing in Table 2 and Figure 2, the priority factor that has the greatest level of influence in the management of industrial waste of Sustainable Batik MSMEs in Jambi City in the environmental aspect is waste management with a weighting value of 51%. The main objective of wastewater treatment is needed to reduce the content of pollutants in water, especially organic compounds, solids or suspended matter, pathogenic microbes and organic compounds that cannot be broken down by microorganisms found in nature.(Ragil et al., 2023). The weight of the economic sub-criteria in Table 3.

Table 3
Weighting of Economic Sub-Criteria for Sustainable Management of Industrial Waste by Batik MSMEs

Economic Sub-criteria	Weight	Percentage (%)
Waste Management Costs	0.366	49
Potential Business Efficiency	0.229	30
Incentives from government and institutions	0.155	21

To see the weighting of factors and their influence on the management of sustainable batik MSME industrial waste in a graph, see Figure 3.

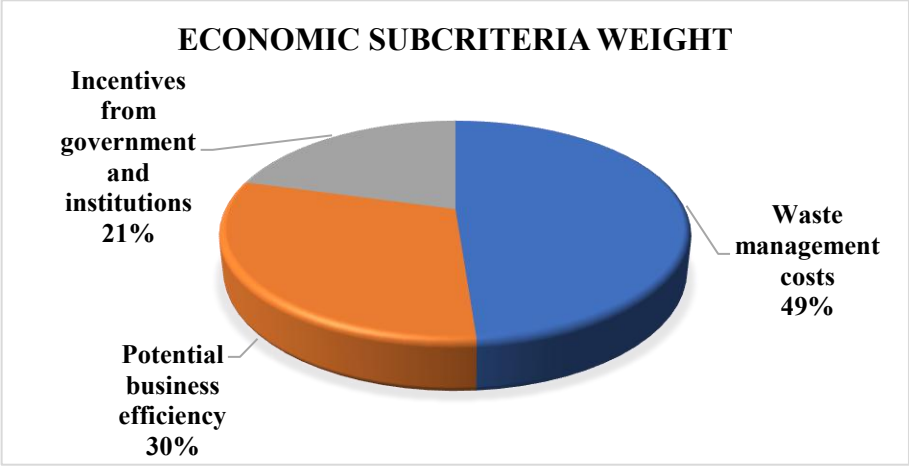

Figure 3 Priority of Economic Sub-Criteria for Management

Based on the data processing results in Table 3 and Figure 4, the priority factor with the greatest level of influence on the management of industrial waste by Sustainable Batik MSMEs in Jambi City in terms of economic aspects is waste management costs, with a weighting value of 49%. To date, financing waste processing technology from existing batik industries is still considered expensive by batik industry players. According to (Rambe D et al., 2024) Environmental costs are incurred to reduce environmental impacts, such as waste management, the use of environmentally friendly materials, and waste reduction initiatives. Costs incurred to protect and maintain the environment are not only mandatory but can also encourage companies to focus more on social responsibility, ultimately leading to the implementation of sustainable accounting practices.

For example, the construction and operation of wastewater treatment plants (WWTPs) is simply impossible for small-scale batik industries to undertake independently. Therefore, the government needs to regulate facilitation and assistance for

the construction and operation of WWTPs for small-scale batik industries. Several approaches to using communal WWTPs for batik industries located within a single industrial center are available. Portable wastewater treatment equipment is needed that can be processed interchangeably between small-scale batik industries. Similarly, appropriate wastewater treatment technology is needed for medium-scale batik industries with higher production capacities that must manage their batik waste independently. The weights of the social sub-criteria in Table 4 are as follows:

Tabel 4
The Weight of Social Subcriteria for Sustainable Batik MSME Industrial Waste Management

Social Sub-criteria	Weight	Percentage (%)
Community Participation	0.116	12
Public Knowledge	0.507	51
Occupational Health	0.263	26
Perception	0.114	11

To see the weighting of factors and their influence on the management of sustainable batik MSME industrial waste in the graph, see Figure 4.

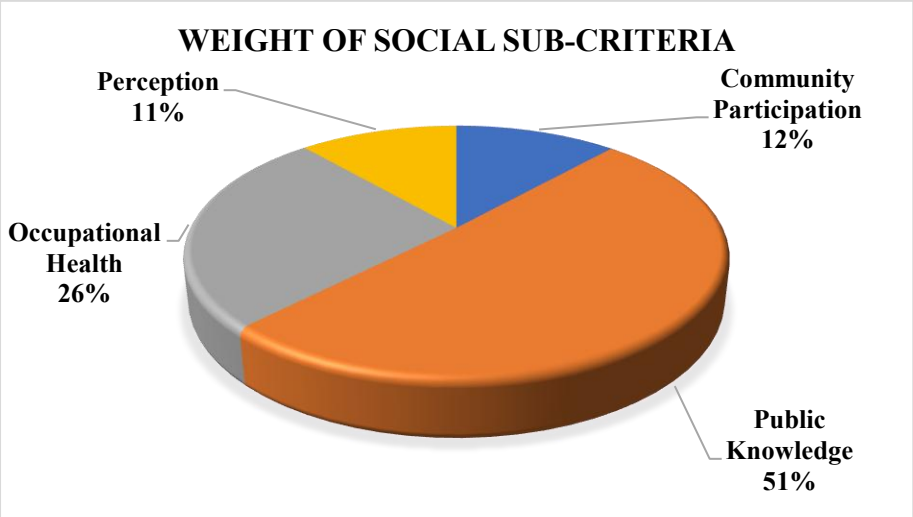

Figure 4 Priority of Social Sub-Criteria for Sustainable Management of Batik MSME Industrial Waste

Based on the data processing results in Table 4 and Figure 4, the priority factor with the greatest level of influence on the management of industrial waste by Sustainable Batik MSMEs in Jambi City in the social aspect is public knowledge with a weighting value of 51%. Batik industry players generally have an understanding that waste disposed of directly into the environment without treatment can pollute the environment. However, they have limited knowledge about the characteristics and level of danger of the resulting batik waste. Similarly, there is limited information regarding appropriate technology as a way to solve waste management problems. The institutional sub-criteria weights are in Table 5.

Table 5
Institutional Sub-Criteria Weights for Sustainable Batik MSME Industrial Waste Management

Institutional Sub-criteria	Weight	Percentage (%)
Availability of Regulations	0.219	29
Institutional Capacity	0.097	13
Supervision dan Monitoring	0.434	58

To see the weighting of factors and their influence on the management of sustainable batik MSME industrial waste in a graph, see Figure 5.

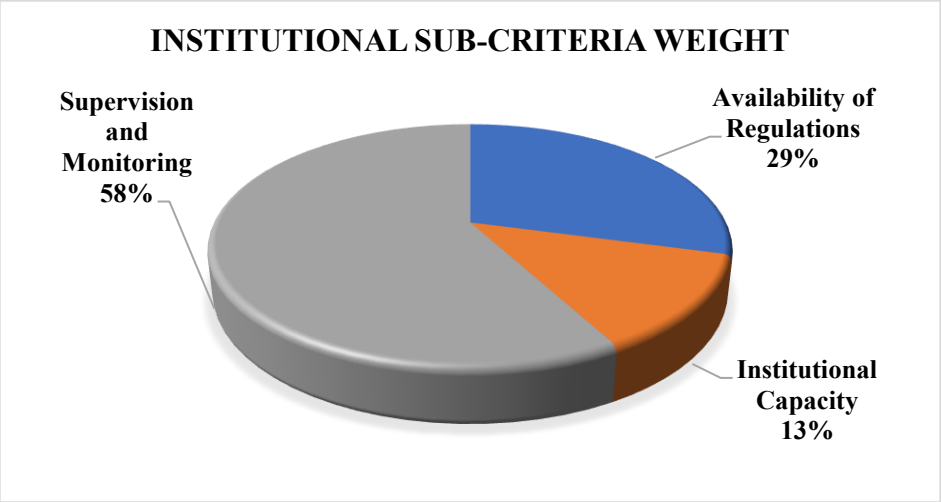

Figure 5 Institutional Sub-Criteria Priorities for Sustainable Batik MSME Industrial Waste Management

Based on the results of data processing in Table 5 and Figure 5, the priority factor that has the greatest level of influence on the management of industrial waste by Sustainable Batik MSMEs in Jambi City in the institutional aspect is supervision and monitoring with a weighting value of 58%. In carrying out waste management, it cannot be done only through socialization, knowledge, or participation because awareness of environmental sustainability involves behavior, concern, awareness, and commitment. Therefore, it is necessary to carry out supervision and monitoring that can be carried out by various parties, including the government, batik industry associations, and batik lovers, continuously and sustainably(Indrayani, 2022).

Alternatives to Sustainable Batik MSME Industrial Waste Management The alternatives aim to assess the level of influence of an alternative element on the sub-criteria at the third level. The weights and priorities of alternative elements at the fourth level can be seen in Table 6 and Figure 6 below.

Table 6
Weighting of Alternatives for MSME Industrial Waste Management Sustainable Batik

Alternative	Weight	Percentage (%)
Communal Wastewater Treatment Plant	0.160	21
Natural Dye Technology	0.450	60
Partnership	0.140	19

To see the weighting of factors and their influence on the management of sustainable batik MSME industrial waste in a graph, see Figure 6.

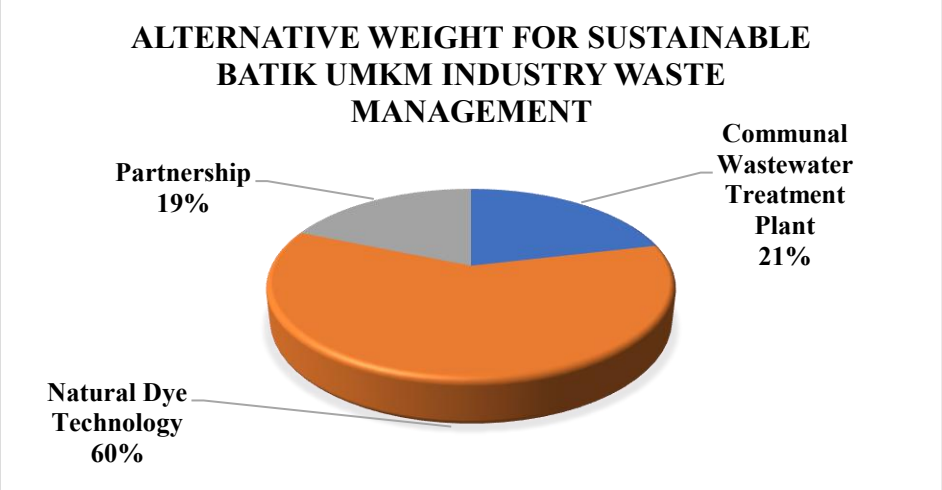

Figure 6 Institutional Alternative Priorities for Sustainable Management of Batik MSME Industrial Waste

Based on the results data displayed in Table 6 and Figure 6, the results of horizontal processing of alternative natural dye technology towards the goal of Sustainable Batik MSME industrial waste management are the priority with a weighting value of 60%, with the selection and management using natural dye technology. Many ways can be done to reduce textile dye waste by using natural materials. Natural dyes applied to natural fiber materials such as cotton fabric can absorb color well. In addition to reducing the amount of waste, this method can increase creativity in making textile variations, so that textile products have a higher sales value(Ragil et al., 2023).

Meanwhile, batik makers, as the primary actors in the batik production process, need to be equipped with knowledge and skills in waste management. They can be trained in waste reduction techniques, such as the use of environmentally friendly dyes and the optimization of fabric cutting patterns. Natural dye technology involves dyeing batik with natural dyes derived from natural materials such as plants, fruits, roots, and even insects. This natural dyeing process differs from the synthetic dyes commonly used in modern batik production.(Afiatna et al., 2024). Below are some examples of natural materials used to dye batik in natural colors (Afiatna et al., 2024) :

1. Plants: Certain leaves, flowers, and bark can be used to produce various shades of green, yellow, red, and brown.
2. Roots: Certain roots, such as sappanwood, noni, and teak, are used to produce red, orange, and brown.
3. Fruits: Some fruits, such as mangosteen rind and pomegranate rind, can be used as natural dye sources.
4. Insects: Natural dyes such as cochineal, which comes from parasitic insects, are used to produce intense reds. The natural dyeing process for batik involves extracting dye from these natural materials and then applying it to the batik cloth. This process can require more time and attention than using synthetic dyes, but it produces unique and natural colors. Natural dyes tend to be more environmentally friendly and also have good durability if properly cared for. Natural dyed batik is

often valued for its artistic value, sustainability, and the uniqueness of its naturally occurring colors.

From archaeological evidence, small amounts of plant and animal materials were originally used to extract natural dyes. (Liu et al., 2021). As supported by most studies, the advantages of natural dyes lie in their subtle, soft, and elegant colors, along with health benefits and non-toxicity, biodegradability, environmental compatibility, and even medical value.(Sutrisna et al., 2020). Furthermore, the communal wastewater treatment plant (WWTP) alternative is the second priority with a weighting of 27%, and the last priority alternative is Partnership with a weighting of 20%. These two alternatives have almost the same weighting, indicating that they have almost the same impact on the implementation of these objectives. Although there are practical concerns that natural dyes tend to incur higher production costs, lower color brightness, and marketing barriers, scientific evidence shows that these weaknesses can be minimized. Recent reviews and experimental studies indicate that optimized extraction techniques, the use of biomordants, and pre- and post-dying treatments significantly improve the color fastness and color intensity of natural dyes, approaching the performance of synthetic dyes.

Furthermore, case studies in the Indonesian batik industry and consumer behavior research indicate that there is a market segment willing to pay a premium for environmentally friendly and culturally valuable products, providing economic space for MSMEs to maintain profitability despite slightly higher initial input costs. Therefore, the choice of natural dyes in this study can be justified from a technical, environmental, and marketing perspective if accompanied by appropriate production and branding strategies. (Pizzicato et al., 2023). Based on the results of vertical data processing above, it is basically almost the same as horizontal processing, but there are several weight values that are slightly different, but do not change the priority results of the decision on sustainable batik UMKM industrial waste management.

The results of primary data processing using the expert choice above, it is known that the priority criteria are social criteria with a weight of 36%, the priority sub-criteria in the environmental aspect are pollution reduction with a weight of 27%, the priority sub-criteria in the economic aspect are waste management costs with a weight of 48%, the sub-criteria in the social aspect are knowledge with a weight of 51%, the sub-criteria in the institutional aspect are supervision and monitoring with a weight of 61%, while the priority alternative for the management of Sustainable Batik MSME industrial waste is Natural Dye Technology with a weight of 55%. Based on the main priorities selected from the primary data processed using expert choice, the results are the same as those obtained from the prioritization of data processed using Microsoft Excel 2024.

Institutional factors, with a weighting value of 0.13, do not significantly influence the sustainability of batik MSME industrial waste, compared to social factors (0.362), economic factors (0.268), and environmental factors (0.24). Social factors, as the main priority, have a greater influence than economic, environmental, and institutional factors. Batik industry players generally understand that waste disposed of directly into the environment without treatment can pollute it. However, they have limited knowledge about the characteristics and level of danger of the resulting batik waste. Similarly, information on appropriate technology as a means of solving waste management problems is limited.

The main priority sub-criteria in the vertical calculation are supervision and monitoring, with a weighting value of 0.616. This is essential for sustainable waste management of batik MSME industrial waste. In carrying out batik waste monitoring, the Jambi City Environmental Agency has the following functions: a. Formulating environmental policies; b. Implementation of government affairs in the environmental sector; c. Environmental management which includes: planning for environmental protection and management and planning for strategic environmental studies, environmental impact studies and increasing environmental capacity; d. Waste management which includes: waste reduction and waste handling; e. Management of hazardous and toxic waste; f. Management of green open spaces including: parks, city forests, shade trees and green belts; g. Control of environmental pollution and damage, environmental maintenance and environmental monitoring; h. Environmental management which includes: handling complaints and resolving environmental disputes and law enforcement; i. Supervision in the environmental sector; j. Implementation of the Technical Implementation Unit (UPT) of the Environmental Service; k. Implementation of deconcentrating funds, assistance tasks and Special Allocation Funds (DAK) in the environmental sector; l. Implementation of strategic programs in the environmental sector including: Adipura, Adiwiyata, SLHD, Proklim, Car Free Day, Climate Change Mitigation and Adaptation, Blue Sky and PROPER; and m. Implementation of other tasks assigned by the Mayor in accordance with the duties and its function. (Ansori & Nuraini, 2020)

Alternative natural dye technology in the management of batik MSME industrial waste has a weight (0.512) as the main priority for the sustainability of batik industrial waste. Natural dyes add an extra touch to batik, providing a unique character and aesthetic that is different from batik produced with chemical dyes. In addition, the use of natural dyes is also more environmentally friendly and sustainable. Natural dye batik is often the choice for those who value tradition and sustainability in textile art. The process of dyeing natural dye batik involves extracting dye from the natural material and then applying it to the batik cloth.(Afiatna et al., 2024).

Conclusion

Based on the research findings, social aspects (0.362) emerged as the dominant factor influencing waste management in Batik MSMEs in Jambi City, followed by economic (0.268), environmental (0.240), and institutional aspects (0.130). At the sub-criteria level, supervision and monitoring (0.616), knowledge (0.510), and waste processing costs (0.481) were identified as critical determinants of management effectiveness.

The priority strategies ranked as follows: natural and environmentally friendly dye technology (0.549), community-based communal wastewater treatment plants (0.228), and multi-party collaborative partnerships/Pentahelix (0.224). The optimal approach integrates the adoption of natural dyes to reduce pollution loads while maintaining wastewater treatment infrastructure to manage residual synthetic chemicals and wax. This comprehensive strategy requires institutional support, multi-stakeholder collaboration, and active community participation to achieve sustainable batik waste management in Jambi City.

Reference

Adi Ahdiat. (2022). Jumlah Industri Batik di Indonesia Berdasarkan Skala Usaha (2018-2021).

Afiatna, F. A. N. F., Muflihah, N., & Mayasari, A. (2024). Meningkatkan Nilai Produk Batik yang Ramah Lingkungan dengan Pewarnaan Menggunakan Sumber Daya Alam Tumbuhan. Jurnal ABDINUS : Jurnal Pengabdian Nusantara, 8(1). https://doi.org/10.29407/ja.v8i1.21336

Ansori, M., & Nuraini, N. (2020). Pengawasan Pemerintah Daerah terhadap Limbah Usaha Batik di Kota Jambi. Fakultas Hukum Universitas Batanghari Jambi, 4(1), 73. https://doi.org/10.33087/wjh.v4i1.146

Dewi, S. (2022). Strategi Pengelolaan Limbah Cair Usaha Batik di Kelurahan Ulu Gedong Kecamatan Danau Teluk Kota Jambi. Universitas Jambi.

Dzaki Rambe, Annisa Kusumawati, Risda Emilia Harahap, Y. M. (2024). Pengaruh Biaya Usaha, Biaya Lingkungan, Kepedulian Lingkungan Terhadap Implementasi Green Accounting UKM Batik Bantul. Jurnal Riset Dan Penalaran Mahasiswa, 2(1).

Hardani. (2024). Pengolahan dan Daur Ulang Sampah Kain Batik: Perpaduan Budaya dan Kepedulian Lingkungan. Axios.

Hariadi, U. (2021). Batik Jambi Koleksi Museum Negeri Provinsi Jambi. Departemen Pendidikan dan Kebudayaan Kantor Wilayah Provinsi Jambi Bagian Proyek Pembinaan Permuseuman Jambi.

Hastutiningrum, Lestari, P., Andika, & Erika. (2017). Dampak Limbah Cair Terhadap Kesehatan Manusia. Jurnal Lingkungan Binaan Indonesia, 2(1), 14.

Indrayani, L. (2022). Upaya Strategis Pengelolaan Limbah Industri Batik Dalam. Seminar Nasional Industri Kerajinan Dan Batik, 2(1), 8. https://proceeding.batik.go.id/index.php/SNBK/article/view/34%0Ahttps://proceeding.batik.go.id/index.php/SNBK/article/download/34/29

Kementrian Perindustrian. (2020). Data Unit Usaha Batik Kota Jambi.

Kurniawan, W., Purwanto, & Sudarno. (2020). Strategi Pengelolaan Air Limbah Sentra Umkm Batik Yang Berkelanjutan Di Kabupaten Sukoharjo. Jurnal Ilmu Lingkungan, 11(2). https://doi.org/10.14710/jil.11.2.62-72

Liu, Zhao, K., She, & Zhou. (2021). Profiling by HPLC-DAD- MSD reveals a 2500 – years history of the use of natural dyes in Northwest. https://doi.org/10.1016/j.dyepig.2021.109143.

Mahfudhloh, & Lestari, H. (2022). Strategi Penanganan Industri Batik. Journal of Chemical Information and Modeling, 53(9).

Pizzicato, B., Pacifico, S., Cayuela, D., Mijas, G., & Riba-Moliner, M. (2023). Advancements in Sustainable Natural Dyes for Textile Applications: A Review. Molecules, 28(16). https://doi.org/10.3390/molecules28165954

Purwaningrum, Alifah, Widianto, H., Arrozain, M. D. F., Purnamasari, R., Suniarti, Y., & Ansyori, M. (2023). Pengelolaan Limbah Batik Berkelanjutan Kecamatan Ulu Gedong. In Universitas Jambi (Vol. 1, Issue 1). https://doi.org/10.30883/jba.v42i2.955

Ragil, A. W., Saifudin, A. G., Gunawan, A., & Novaria, D. (2023). Analisis Strategi Pengelolaan Air Limbah Industri Batik Yang Berkelanjutan Di Kota Pekalongan. Jurnal Sahmiyya, 2(1).

Ramadhan, Munthe, A., M. Yarham, & Siregar, R. (2020). Peranan Usaha Mikro Kecil Menengah Terhadap Perekonomian Indonesia. Jurnal Ekonomi Bisnis, Manajemen Dan Akuntansi, 2(3), 593–614. https://doi.org/10.61930/jebmak.v2i3.321

Sabrina Hartianingrum, H., & Yuadi, I. (2024). Analisis Bibliometrik: Perkembangan Kebijakan Pengelolaan Limbah Usaha Mikro Kecil Menengah (UMKM) berbasis Circular Economy. HIGIENE: Jurnal Kesehatan Lingkungan, 9(3). https://doi.org/10.24252/higiene.v9i3.38144

Sutrisna, P. D., Hadi, R. P., Valentina, J. J., Priyantini, H. R., Waluyo, P. W., & Ronyastra, I. M. (2020). Natural dyes extraction intended for coloring process in fashion indutries. IOP Conference Series: Materials Science and Engineering, 833(1), 1–6. https://doi.org/10.1088/1757-899X/833/1/012093