Review

Sustainable Development of Batik Industry: A Literature Review

Jurry Hatammimi * and Arien Arianti Gunawan

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Sustainable Development of Batik Industry: A Literature Review

Jurry Hatammimi [1,*] and Arien A. Gunawan [2]

[1] School of Economics and Business, Telkom University, Indonesia; jurryhatammimi@telkomuniversity.ac.id
[2] School of Economics and Business, Telkom University, Indonesia; ariengunawan@telkomuniversity.ac.id
* Correspondence: jurryhatammimi@telkomuniversity.ac.id; Tel.: +62-22-7503621

Abstract: Although the contribution of the Indonesian batik industry is quite significant, its activities also lead to environmental damage. There is thus a need to develop procedures and tools to achieve sustainability and Green Industry Standards. Before doing so, it is important to conduct a systematic literature review regarding this topic. This study investigates the existing research and debates relevant to sustainability in the batik sector. Therefore, this study provides an understanding of responsible batik consumption and production activities. After reviewing 42 papers from 593 generated results, the batik production aspect is the most dominant aspect analysed by the papers, with production waste being the most-discussed topic. There are opportunities to update the research on the batik production aspect, enrich the discussion about the organisation and marketing aspects, and begin to examine the finance-related aspect regarding the sustainable batik theme.

Keywords: sustainability; batik; Green Industry Standards

1. Introduction

The United Nations has emphasized the concept of sustainable development. This includes SDG 12 (Sustainable Development Goal 12), which focuses on responsible consumption and production activities. SDG 12 can help business owners and consumers manufacture clean, efficient products, and be responsible for the waste generated after production or consumption [1]. The implementation of SDG 12 is aligned with the notion of green entrepreneurship. These are both important to implement to avoid more severe environmental damage, whose recovery takes longer than prevention. Unfortunately, the implementation of SDG 12 in developing countries, including Indonesia, is still very slow and not yet comprehensive. This can be seen from the lack of information on the implementation of SDG 12, specifically in the batik industry.

The batik industry, as part of the creative economy, contributes significantly to the Indonesian economy by employing 200 thousand people in 47 thousand registered business units. The batik industry also recorded exports of USD 532.7 million in 2020 [2]. As a world cultural heritage recognized by UNESCO (United Nations Educational, Scientific, and Cultural Organization) since 2019 [3], batik is a symbol of the life of the Indonesian people and contains very strong cultural and artistic values [4]. Batik skills are learned from generation to generation and become a source of income [5]. Up until now, the Indonesian batik industry has been dominated by small and medium enterprises (SMEs). However, batik also contributes to environmental damage, especially water and air pollution, due to inefficient production processes and resource utilisation [6,7]. One kilogram of batik can produce up to 125 litres of wastewater containing cancer-causing chemicals because it is disposed of directly into rivers without being treated first [8]. This endangers the health of the surrounding community that uses the river water [7,9] and indicates the absence of environmental, social, and economic sustainability. Therefore, research to make the batik industry more sustainable is urgently needed at this time.

Although the Centre for Handicrafts and Batik has established the "Green Industry Standard" for the batik industry, as stated in [10], not a single batik SME has been able to fulfil this standard

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and obtain certification. To answer this problem, there is a need to develop procedures to achieve the Green Industry Standard for the batik industry. To apply the procedures, the authors also consider creating an online application so that batik SMEs become more competitive and sustainable from the environmental, social, and economic aspects. This application is intended to assist batik SMEs in obtaining certification under the Green Industry Standard for the batik industry. Another benefit of this application is that it can evaluate the use of raw materials so that they are not overexploited and monitor the impact of the production process on the environment, as suggested by the UN [1]. Notably, no research has been carried out on this matter thus far.

Before designing the online application, it is necessary to know the extent of the awareness, understanding, interest, and attitude of stakeholders in the batik industry, such as consumers, craftsmen, batik SMEs' owners, and the government, towards the concept of sustainability. However, before conducting the study to know the extent of awareness, understanding, interest, and attitude of stakeholders in the batik industry, it is important to conduct a literature review on the topic. Hence, this study investigates the existing research and debates relevant to sustainability in the batik sector. This study provides an understanding of responsible batik consumption and production activities.

2. Materials and Methods

Green entrepreneurship is one way to answer the challenge of environmental sustainability [11] and is an initiative taken by an entrepreneur to reduce the negative impact on the environment resulting from his or her business activities [11–13]. "Clean production" is strategic environmental management in the production process done to reduce risks to humans and the environment [14]. The processes in batik production are presented in Figure 1.

To encourage green entrepreneurship, it should be noted that the more positive one's attitudes, subjective norms, and behavioural control are, the stronger one's intention to perform the behaviour is. For example, if the owner of a company perceives sustainability as a positive behaviour and believes that the people around him will feel a positive impact, and he also has the ability to carry out this behaviour, the stronger his intention to carry out the sustainable activities will be, as will his chances of doing so [15,16]. The negative perception of increasing production costs is often seen as an obstacle to green entrepreneurship [16], and this affects the implementation of green entrepreneurship [16,17].

Factors supporting green entrepreneurship are complex [18]. For green business owners, strong ethical values underlie their adoption of green entrepreneurship [19]. Previous researchers have categorized green entrepreneurial factors into two categories: internal and external [20–22]. Internal factors come from within humans and organizations [20], such as personal values [22,23]. The intersection of one's identity, such as gender, religion, and ethnicity, affects one's motivational values in adopting green entrepreneurship [23]. This study shows that the motivational values that appear in environmentally friendly batik SMEs are related to self-actualization, personal ability improvement, and concern for preserving culture as well as for humans and the surrounding environment.

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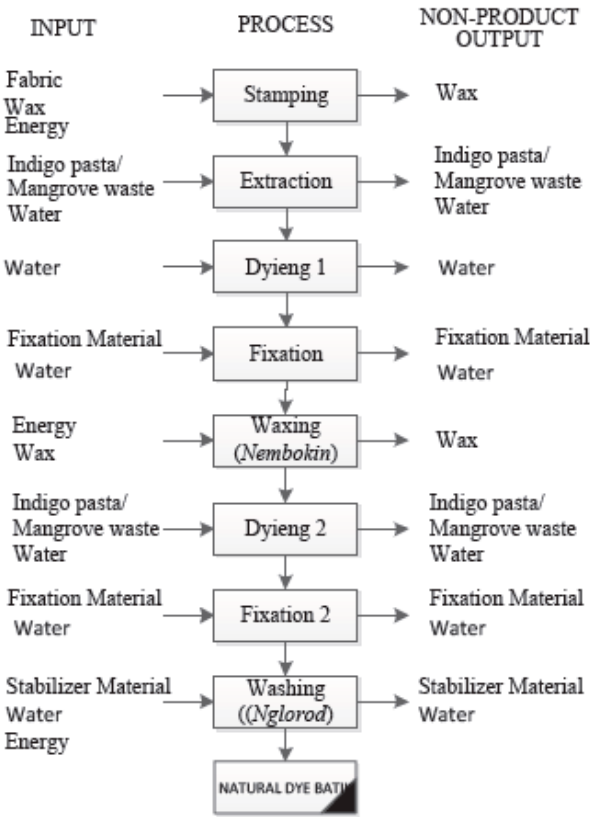

Figure 1. Batik Production Process. Source: [24].

There are also internal organizational factors, including the commitment from the highest management, technology, organizational resources, and incentives, cost savings, and competitive value [25]. On the other hand, external factors include factors such as regulation, supply chain pressures, consumer demand, stakeholders, such as families, and the environment [20,22,25]. According to some researchers, internal factors are very influential in the implementation of green entrepreneurship [20,21] because external factors need to be translated into internal motivation before they can bring about change in the organization.

Moreover, the green industry is one of the objectives of industrial operations, as stipulated in Article 3 of Indonesian Law No. 3 in 2014 concerning industry [26]. In order to balance industrial expansion with the maintenance of environmental functions and to benefit the community, the green industry places a high priority on efficiency and effectiveness in the sustainable use of resources. The Ministry of Industry offers green industry certification services to businesses that have benefited society, the economy, and the environment by using resources wisely and employing environmentally friendly manufacturing techniques in an effort to promote the development of the green industry. The certification facilitation intends to inspire the sector to intensify efforts in the direction of the green industry. Of course, the requirements outlined in the Green Industry Standards must be met by the industries that want green industry standards (GIS). For several industry groups, the Ministry of Industry is creating GIS. Regulation of the Minister of Industry Number 39 for 2019 mandates GIS for the batik sector [10].

A systematic literature review was conducted for this study, which includes a "snapshot" of the state of knowledge over a specific period. As it offers fresh perspectives, it enhances narrative reviews [27]. This study uses scientific articles from 2017 to 2022 (August 25, 2022). It is hereby considered an extension of the [28] conducted study, which performed a 10-year search from 2008 to 2017, discovering 82 articles on sustainable batik manufacturing issues. Systematic reviews are intended to be updated frequently to look for new evidence and have the goal of monitoring and capturing emerging knowledge within a particular research topic [27]. Clarity, internal validity, research transparency and governance are all improved by a comprehensive literature review. It also increases

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communication among academics about the theoretical underpinnings of a study (auditability). The current study employs Boolean logic to select pertinent material for this study by properly combining search phrases. The AND, OR, and NOT Boolean operators were utilized.

The initial step of the systematic review was locating academic papers using the keywords "sustainable" AND "batik." The literature search was done on an electronic database, and this review chose ProQuest. Business information can be found on ProQuest in a variety of formats, including scholarly journals, dissertations, company profiles, industry profiles, and market-specific trade news. The database offers access to around 11,000 full-text scientific articles from top publishers worldwide. ProQuest is used by more than 26,000 libraries in more than 150 countries, 98 percent of the top 400 colleges in the world rely on it, more than 130 million students and researchers can use it, and it partners with more than 9,000 publishers and content suppliers [29].

The types of sources selected were scholarly journals and conference papers and proceedings. These were chosen because of their nature, i.e. they were reviewed, either via single-blind peer review or double-blind peer review. The publishing dates of the article ranged from 1 January 2017 to 25 August 2022. After setting these search limitations, 593 results were generated, which were then sorted by relevance. To make sure that prospectively relevant articles were selected, the authors manually screened all the 30 pages available. After manual screening that focused on the title and abstract, 46 prospective articles were found. Following that, each article was examined to ensure content relevance.

3. Results

After a careful reading of the 46 articles, four articles were unable to go to the next process. The relevant articles left included 42 results. The first of these four articles discusses the preservation, standardization, and information technology 4.0 in the context of batik to ensure marketing competitiveness during the COVID-19 era [30]. The sole production-related topic covered in this article is the methods used for melting and drying colours to expedite production. The second article compares Champa and Batik Lasem from the 15th to the 19th century [31]. This study mostly analyses motif creation, and the author creates four acculturation motifs. The third one examines how to sustain batik SMEs' businesses [32]. This study shows that business scale, market access capacity, and financial capacity influence the competitiveness level of batik SMEs. The last article excluded from the further review is a study about rural batik tourism in Banyuwangi [33]. This study examines the use of the community-based tourism (CBT) approach to develop a tourism village.

Based on the type of source among the 42 results, there are more conference papers and proceedings (27) than scholarly journals (15). The sources were published between 2017 and 2022. Year after year, the number of papers on the sustainability of batik production fluctuated. For the year 2017, this review found only one paper. There are five papers from the year 2018, two papers from the year 2019, 10 papers from the year 2020, 20 papers from the year 2021, and four papers from the year 2022, until August when this review was written. It can be observed that 2021 is the year with the greatest number of papers, followed by 2020 and 2018. Figure 2 presents the distribution of the papers based on the publication year.

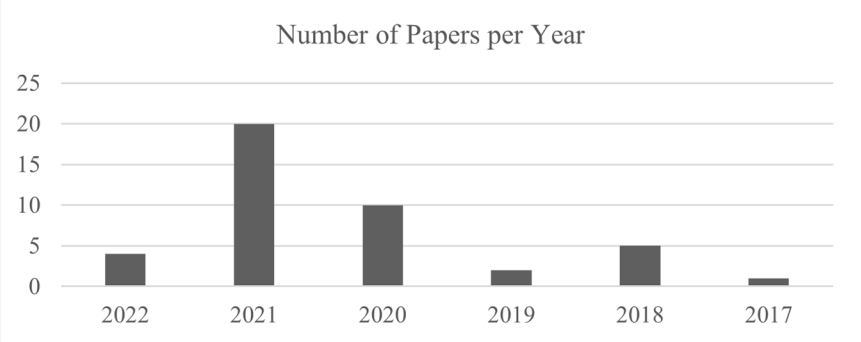

Figure 2. Distribution of Papers Per Year.

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Analyzing the types of papers across the publishing timespan reveals that 2021 was the year with the most conference and journal papers, with 14 conference papers and 6, respectively. The detailed distribution of paper types across the period under consideration can be seen in Table 1.

Table 1. Distribution of Paper Types Per Year.

Year	Conference	Journal
2022	1	3
2021	14	6
2020	7	3
2019	1	1
2018	4	1
2017	-	1

The authors classified the 42 articles that were further examined into four management aspects: production, organization, marketing, and finance. More specifically, the production aspect was divided into four categories: materials, dyeing, waste, and the full process. This produced seven categories in total. In the materials sub-category of the production aspect, there are four studies [34–37]. There are eight studies included in the dyeing sub-category [38–45]. Moreover, 15 studies are included in the waste sub-category [46–60]. This sub-category has the most papers among all the categories. The last sub-category of the production aspect is the full process, and it consists of six studies, which were conducted by [24,61–65].

Furthermore, the organisation category consists of seven studies [66–72]. Lastly, the category that has the fewest articles is the marketing category. It consists of only two studies [73,74]. Unfortunately, there is no study in the finance-related category. To summarise the distribution of the papers based on the analysis category, Table 2 presents the details. It can be observed that the majority of the papers discuss the production aspect. In particular, batik production waste is the most discussed topic, with 15 papers, followed by dyeing with eight papers, the full production process with six papers, and materials with four papers.

Table 2. Distribution of Papers Per Category.

Production: Materials	Production: Dyeing	Production: Waste	Production: Full Process	Organisa-tion	Marketing	Finance
4	8	15	6	7	2	0

When the papers' categories are compared across the time the papers were published, the studies of production-related aspects show an increasing trend from 2019 to 2021. Since 2022 is still ongoing, it is expected that the increasing trend will be achieved at the end of 2022 and beyond. The detailed distribution of the papers' categories across the period of publication can be seen in Table 3.

Table 3. Distribution of Paper's Category Per Year.

Year	Producti-on: Materials	Producti-on: Dyeing	Producti-on: Waste	Producti-on: Full process	Organisa-tion	Marketi ng
2022	-	-	1	1	2	-
2021	3	5	6	2	2	2
2020	1	3	3	1	2	-
2019	-	-	2	-	-	-
2018	-	-	3	1	1	-

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2017	-	-	-	1	-	-

In these 42 papers, only two countries are examined: Indonesia and Malaysia. This is understandable since batik is popular in both of these countries. However, the studies predominantly focus on the Indonesian context. There are 35 papers whose study locations are in Indonesia, while only 7 studies focus on the Malaysian context. The detailed distribution of the locations of the study in Indonesia can be seen in Table 4.

Table 4. Distribution of Locations of The Study in Indonesia.

Province	Area	Paper
DKI Jakarta		1
West Java	Jababeka	1
	Cirebon	1
	Indramayu	1
Central Java	Pekalongan	3
	Sukoharjo	2
	Semarang	1
	Klaten	2
	Surakarta	3
	Banyumas	2
Yogyakarta	Sleman	1
	Yogyakarta	1
East Java	Surabaya	1
	Jember	2
	Malang	2
	Not specified	1
Bangka Belitung		1
West Sumatera		1
Not specified		8
Total		35

It can be seen that the province that is most often the setting of the research in these papers is Central Java, with 13 studies, whereby the two areas that are the most discussed are Pekalongan and Surakarta. However, research on the sustainability of batik is still being conducted in the western part of Indonesia, particularly in Java.

4. Discussion

In the materials sub-category of the production aspect, it was found that the current materials used to manufacture batik are more environmentally friendly. For example, in 2014, the use of copper stamps began to be replaced by wastepaper stamps [36]. Besides complying with the GIS (Green Industry Standard), this innovation also lowers the cost. Another action is discussed by [37], who gives ideas for producing block batik using bamboo. The usage of water as a material for batik production that complies with the GIS is highlighted by [35]. Lastly, [34] investigate the use of tamarind paste, or gutta, as a sustainable resource that serves as wax during the creation of batik.

Although some studies have shown the utilisation of materials that align with the GIS, the composition ratio for this utilisation should also be explored.

In the dyeing sub-category of the production aspect, it was found that most of the papers analyse the alternative materials for dyes rather than discussing GIS-compliant dyeing processes. There are five papers focusing on the dyeing material. The first is [38], who mentions wood waste as a source of batik dyes that can produce safer and more eco-friendly dyes than synthetic ones. [43] analyses the waste of some local plants for use as natural dyes. [44] investigate the use of Bayat clay to save money and reduce production waste. [42] investigate the enormous potential of coconut fibre as a source of natural dyes for batik. Lastly, the study by [45] finds that biomass wood waste can be utilised as batik dyes. There are three more papers that focus on the dyeing process. [40] place a strong emphasis on the use of natural dyes to promote eco-friendly dyeing, increase knowledge of it, and expose people to the practice. [39] investigate how the batik technique affects the colour and durability of the dyed materials. Lastly, [41] discovers that the use of environmental catalysts in the natural dyeing process encourages the use of eco-friendly chain processes for regional textile production.

In the waste sub-category of the production aspect, the 15 papers are divided into four major issues, namely adding material to the wastewater, conducting processes for the wastewater process, the importance of wastewater management, and the condition of the wastewater. Adding material to wastewater is the most discussed issue and is described in seven papers. The adding material to wastewater issue is analysed by [50], who explored the addition of bacteria to the wastewater. [56] measures the Tyndall effect after using papaya seeds in the wastewater. [53] applies cationic surfactant-modified Mengkuang leaves to batik wastewater. [55] uses phytoremediation to treat wastewater. Kenaf is used in wastewater [49]. [58] uses immobilized Trichoderma viride in wastewater. Lastly, [57] uses rice husks and Canna indica plants in the batik wastewater treatment process.

Furthermore, conducting processes for the wastewater process is the second-most discussed issue and is covered in five papers. The issue of the conducting process in the batik wastewater process is discussed by [48], who analyses the visible light irradiation, [52] focuses on the right wastewater treatment system, while [51] proposes electrocoagulation as a method in the first step of the wastewater process. [54] analyses the decrease in the external resistor value of the wastewater process, and [46] proposes a photodegradation process to treat wastewater.

Only two papers study the importance of wastewater management. First, [47] examines the need for batik wastewater treatment and the roles of government, society, and batik industry players. Second, [60] analyses the priorities in wastewater management. The last issue is the condition of wastewater. This issue is only addressed in a study [59] which shows that the flow of batik waste affects water quality.

Moving to the next sub-category, six papers are included in the full process sub-category of the production aspect. [63] looks at how batik is made and how batik businesspeople see the environment. [65] captures the process of Mega Mendung batik as well as its eco-promotion. [62] demonstrates how green business practices may be implemented at all stages of the batik production process. A useful approach for locating non-value-added operations in the manufacture of natural dye batik utilizing a lean manufacturing system is provided by [24]. [64] assesses that cleaner production uptake could significantly reduce the environmental impact. Lastly, [61] proposes alternatives to increase the energy efficiency of the production of stamped batik.

In addition, seven papers address the organizational aspect. First, [66] identifies the barriers faced by batik SMEs that hamper more sustainable batik. [72] investigates how environmental commitment affects the small batik industry's adoption of the circular economy in a favourable and important way. [67] explores sustainability-oriented innovation (SOI) in a batik cultural village. [71] discusses the implementation of open innovation by some batik SMEs. [68] creates a brand-new evaluation method with four main components: company characterization, business model description, analytic input and output, and readiness area for the batik company. [70] discovers that economic sustainability has a significant and positive impact on the environmental sustainability of batik SMEs. Lastly, [69] suggests a dynamic evaluation strategy for the batik industry's sustainable

supply chain management. Moreover, there are only two papers on the marketing-related aspect. First, [74] discovers that natural colour batik artisans or ecopreneurs need strong green values to succeed in their line of work. Second, [73] discovers that knowledge and attitudes about green products have a beneficial impact on the intention to buy green batik products created from natural substances.

Although this study is considered an extension of [28] in terms of the publication year of the papers reviewed, this study does not solely focus on the production process of batik but also spotlights other aspects of management, such as organization and marketing. This study also enhances the results by analysing the papers based on the location of their respective studies. This will help to map the level of concentration during the research. Besides their differences, the first and second-most discussed topics in this study and [28] paper are the same, namely the batik production waste and the dyeing process.

5. Conclusions

A search for the theme of sustainable batik returned 42 papers. Based on the type of source, conference papers, and proceedings are more dominant than journals. There is a fluctuating amount of research on the sustainability of batik production year by year. It can be observed that 2021 is the year with the greatest number of papers, although the number of papers in 2022 can still increase.

The majority of the papers analyse the batik production aspect, with production waste being the most discussed topic. While the marketing-related aspect is the least discussed, no paper discusses the finance-related aspect. The location of the research is still primarily in Indonesia. This is especially significant in light of UNESCO's designation of Indonesian batik as a World Cultural Heritage in 2019. Specifically, the most discussed location is Central Java, a province that has been analysed in 13 papers. For further study, there are opportunities to update the progress of the research on the aspects of batik production, enrich the discussion about the organisation and marketing aspects, and initiate an examination of the finance-related aspect regarding the sustainable batik theme. It is anticipated that the study will be carried out outside the province of Central Java based on its location. Therefore, the data for the comprehensive sustainable batik study will be gathered from different areas in Indonesia.

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