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BATIK WASTE PROCESSING AS AN EFFORT TO A GREEN INDUSTRY IN WONOGIRI OF CENTRAL JAVA, INDONESIA

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ABSTRACT

Behind the role of Small and Medium Industries (SMI) in economic growth, SMI has many problems. One of them is the problem of waste management and the sustainability of raw materials. Tirtomoyo District, Wonogiri Regency, has a Wonogiren Batik SMI Center and is designated as a regional superior product. The purpose of the research is to be able to provide solutions to create a green industry in the Wonogiren Batik SMI center against the potential threat of the reservoir water quality standard without having to turn off the existing SMI center in Tirtomoyo District. The research method is Mixed Methods Research which combines qualitative and quantitative research and data sources using primary and secondary data. The results showed that the presence of SMI batik has the potential to pollute waterways. To anticipate pollution that is too widespread, waste treatment can be carried out and the use of raw materials that are more environmentally friendly.

KEY WORDS

Batik center, waste, pollution, green industry.

The area of Wonogiri Regency covers land and waters of approximately 190,432 hectares. Based on the 2020-2040 regional regulations, the development of Industrial Designated Areas (KPI) is set to cover an area of approximately 4,833 hectares, directed at all sub-districts: Pracimantoro; Giriwoyo; Wonogiri; Selogiri; Ngadirojo; Sidoharjo; Wuryantoro; Giritontro; Eromoko is designated as a large, medium and small Industrial Designated Area, while for other sub-districts it is only allowed for small and medium industries. Tirtomoyo District, Wonogiri Regency, is an area that has been determined based on Regent Regulation No/18 of 2021 to become the Center for Small and Medium Industries (IKM Batik Wonogiren). Wonogiren batik is the original batik of the Wonogiri area with the characteristic "remekan" model (Lestari & Syafii, 2019) and has been designated as a regional superior product in the Regional Regulation on the Industrial Development Plan of Wonogiri Regency 2022-2042. Geographically the Wonogiren Batik SMI Center is located in the upper reaches of the Wonogiri Multipurpose Reservoir which is a water catchment area which is then managed to become a source of water in several areas of Wonogiri Regency and the surrounding area.

Wonogiren batik is one of the cultural arts originating from Tirtomoyo Village, Tirtomoyo District, Wonogiri Regency, Central Java. Wonogiren batik is a batik work made by the Tirtomoyo community. The history of batik in Tirtomoyo is related to the batik of Solo and Yogyakarta. The name Wonogiren batik comes from a batik artist from Pura Mangkunegaran (Surakarta) named Kanjeng Wonogiren or Raden Ayu Praptini Partaningrat, wife of a Regent of Wonogiri (served in the pre-independence era of RI). Kanjeng Wonogiren is the creator of traditional batik textiles. The word "Wonogiren" in the term Wonogiren batik comes from the word "Wonogiri" which has the suffix "an", thus indicating ownership or origin. His name is



used to mention batik, because it is famous for babaran or how to give color to batik. The term was given by the people who use his batik works and the batik makers who are still descendants of the noble family of Pura Mangkunegaran. Babaran Kanjeng Wonogiren produces soft, clean, and younger colors, compared to the batik babaran circulating at that time, which tended to be dark and sharp, because the majority of the dyes used natural ingredients such as spices, namely soga. This material produces a brown and dark brown color, which is the hallmark of Surakarta Batik. Kanjeng Wonogiren's works are in demand by officials and nobles of Pura Mangkunegaran, as well as the middle and upper class general public in Surakarta and its surroundings.

In realizing a green industry at the center, the production process needs to be harmonized with the preservation of environmental functions (Nurbaiti et al., 2021) and can provide benefits to the community (Jannah & Muhimmatin, 2019). The location of the IKM center in the catchment area of the reservoir has an impact on the quality of water quality standards, namely a limit or level of pollutants that are discharged or released into water sources (Apriyani, 2018). Every year on average one IKM uses 10,950 kg of batik wax, 182,880 m of gray cloth, 1600 l of H₂O₂, 2000 kg of kostik, and 200 kg of teepol. the average batik production process requires 15,000 l of water, 10 l of kerosene (Mahfudloh & Lestari, 2017). Meanwhile, during the year 12.5% of the wax was wasted, 9.144 m of product failed, 200 liters of H₂O₂ was spilled (Indrayani & Triwiswara, 2018), 24 kg of cosmetics were scattered, 80% of the water used was waste water, 10 kg of teepol was scattered, 50 dyes, 4 kg, no one has used natural dyes (Mahfudloh & Lestari, 2017).

The problem under study is how efforts can be made to create a green industry in the Wonogiren Small and Medium Industry (SMI) center that does not have a negative impact on the quality standards of the Wonogiri Reservoir. The specific goal is to find a solution to the problem of potential threats to the reservoir water quality standards without having to turn off the existing SMI centers in Tirtomoyo District. The urgency of the research is how to find a solution to create a green industry in the Wonogiren batik center without having to turn off the SMI but on the contrary by applying the green industry concept it can increase the competitiveness of the Wonogiren Batik Center SMI.

METHODS OF RESEARCH

The research method is Mixed Methods Research which combines qualitative and quantitative research and data sources using primary and secondary data. Data analysis with concurrent analysis of quantitative data and qualitative data were transformed and compared; in sequential analysis, the implementation of quantitative and qualitative data analysis is separated.

RESULTS AND DISCUSSION

The process of making batik "Wonogiren". The process of making batik goes through several stages from applying wax to the fabric, coloring and pelorodan. Each stage of batik can be done by different people, but one piece of mori cloth can only be done by a craftsman. The following is the process of making Batik Wonogiren in Tirtomoyo Village:

Fabric Preparation. Prior to Batik, the fabric used in TSP Wonogiren batik was a primisima type of fabric. This cloth when purchased is a rolled cloth that is approximately 30 meters long. Previously the fabric was cut first with a size of 200 cm x 100 cm. The cloth used for batik at the Wonogiren batik polling station does not go through the pengemplongan stage or cloth washing, this does not affect the quality of the batik cloth. Proceeded to the stage of patterning batik cloth.

Scratch or Pattern. Nyorek or patterning is a basic process that is carried out before the batik process by tracing or making patterns on the mori cloth to be made batik by imitating existing motif patterns or called nemplek. The pattern to be traced is drawn first on parchment paper first to get a print of the batik motif pattern that will be used as a trace, then the fabric is traced directly on the mori cloth using a pencil and an eraser, erasing when there



is an incorrect plagiarism. The nemppek process is usually carried out from the outermost motif so as not to shift the plagiarized motif, then the innermost motif. Within a day the process of patterning a cloth measuring two meters long and one meter wide. Batik craftsmen can finish four to six pieces of cloth in a day. The first process carried out by the craftsman is to prepare the tools that will be used during the nemppek process, then prepare the trace motifs that will be drawn on the table. The table used in the nemppek process is made of glass because the plane is flat, then arrange the traces in the order of the fabric above the traces, after it has been arranged in a position that corresponds to the motif to be made, the next step is the craftsman drawing according to the trace.

Cepetiki. Cepetiki or what we usually call mencanting is the process of incising night candles on motifs that have been made on cloth. Giving night candles on motifs using a tool called canting. The nyepetiki process is carried out by filling the canting with heated wax, blowing the tip of the canting to prevent it from clogging and then painting the wax on the surface of the mori cloth which has been patterned with a batik motif.

Ngiseni. Ngiseni comes from the word "isi" which means to give content to the batik motif. The canting used for ngiseni uses a small canting adapted to the shape of the isen to be made. For ngiseni, one motif is done first, for example with the cecek motif, all of them are done first and then replaced with another motif.

Coloring. In the coloring process at TSP Wonogiren batik is classified as modern coloring because the dyes used are synthetic dyes. The coloring process in Wonogiren batik is the same as other batik coloring processes using indigosol or using remasol. The color of batik is smeared using a brush or bamboo with foam which is used as a brush to paint the desired area. The patterns that have been drawn motifs are then stretched to be painted in the desired colors. In mencolet usually use remasol or indigosol depending on the color to be made. The color used for pickling is remasol dye which tends to be bright or bright in color, easily soluble in water, has a good color with good fastness, and has low affinity. To improve these properties, batik coloring is done by brushing before being given waterglass.

Color Lock. After the fabric is felt to be completely dry, the next step is to lock the color on the batik cloth using liquid water glass, which is useful as a color enhancer on batik cloth. Waterglass is enough to be dissolved with cold or hot water in a container such as a large tub that has been filled with water. The ratio of water and waterglass is 50:50. Stir until the waterglass is completely dissolved, then dip the batik. When immersing cloth in waterglass, use hand protection, namely rubber gloves. After the locking process with waterglass overnight for the next stage the batik cloth is washed with plain water until clean.

Medel and Bironi. The next process is medel and birony, which is a process to keep the blue color from getting other colors by using wax. The main ingredient for the medel is indigo, the function of the medel is to give a dark blue color as the basic color of the fabric. This process takes approximately one day, because this dye is very slow in permeating the mori cloth so the cloth must be dyed repeatedly. After the process of pressing the cloth, the batik cloth is sogga, sogga is the second color dyeing, to get a brown color by using synthetic sogga. Sogga is done repeatedly and then dried without being exposed to the sun. The next stage is to re-lock the batik cloth that has been folded and is completely dry. Color locking stage by dipping the cloth into the waterglass evenly and then the cloth is left overnight, and then rinsed with plain water. Then the last process is drying. Wonogiren batik that is dried in the sun should not be exposed to direct sunlight because it can damage the color of the fabric.

According to the Republic of Indonesia Law Number 32 of 2009 concerning Environmental Protection and Management (UU PPLH) it is stated that hazardous and toxic materials and their wastes need to be protected and managed properly. The territory of the Unitary State of the Republic of Indonesia must be free from hazardous and toxic waste disposal from outside the territory of Indonesia (Said, 2002). The river is a form of surface water flow that must be managed in a comprehensive, integrated manner with an environmental perspective by realizing the sustainable use of water resources for the greatest prosperity of the people (Haryono et al., 2018).

The existence of the batik industry in Indonesia occupies the category of large, medium, small and even household scale industries (Iskandar & Kustiyah, 2017). This



causes the pollution caused by the batik industry not only to occur in industrial areas but also in densely populated settlements (Apriyani, 2018). Pollution mainly comes from liquid waste in the form of dyes produced by residual dyes, washing and rinsing processes for batik cloth. In general, batik industry waste consists of residual mori, spilled wax, residual staining water, wax residue and pelorodan water (Nurainun et al., 2008). Commonly used dyes are synthetic dyes because they are easy to obtain and produce bright colors. Examples are indigosol, naphthol and indanthrene which are used by industry (Hakim, 2018). The use of synthetic dyes and other processes in batik making such as wax release, washing, soaking, and rinsing will produce liquid waste containing dyes and oils (Setiawati et al., 2016). The batik production process requires large amounts of water and produces waste that is rich in dyes, contains residues of reactive dyes and chemicals, so there needs to be proper management before releasing it into the environment (Trixie, 2020).

Water is the main natural resource for the batik production process (Suharwati, 2019). The large amount of water use produces large quantities of liquid waste as well. The liquid waste has the potential to pollute the environment because it has high Biological Oxygen Demand (BOD)(Christiani et al., 2017) and Chemical Oxygen Demand (COD), pH, Temperature, Total Suspended Solid (TSS) and Total Dissolved Solid (TDS) values (Prasetyo, 2016). Therefore, it is necessary to treat the liquid waste in the batik industry first before the waste is discharged into the environment in order to meet the provisions on wastewater quality standards (Apriyani, 2018).

The batik industry wastewater treatment system usually consists of initial treatment, primary treatment, secondary treatment, and continued with tertiary treatment if the quality of the waste still exceeds the specified quality standard value. At each stage of processing carried out, it is expected to cause changes due to physical, chemical, and biological processes involving operating units or processing units in processing building units.

Initial treatment involves a physical process that aims to separate suspended contaminants in the form of solids from the wastewater. The filtering process in the batik industry aims to separate suspended solids, namely batik wax, insoluble chemicals, and impurities in liquid waste. While the deposition process is intended to separate solids that can settle by gravity.

The second stage of processing is a chemical process, namely by adding coagulant accompanied by rapid stirring to produce a precipitate which is then separated physically. The third stage uses biological treatment by utilizing microorganisms in the water to decompose pollutant materials. Biological treatment is carried out using aerobic and anaerobic bacteria to treat biodegradable wastewater (Nurainun et al., 2008). However, often the three processing processes in the WWTP scheme have not produced liquid waste that meets quality standards. Therefore, an advanced treatment stage is needed, one of which is the wetland method.

In the last decade, a green-based industrial system has become an unavoidable phenomenon (Hariz et al., 2018). The growing public awareness of energy efficiency and environmental sustainability (Green), which is marked by the obligation to certify National and international standards related to Green, forces us to think beyond classical thinking related to productivity, efficiency and effectiveness (Nurwahidah & Anityasari, 2015). The new paradigm, which is a Green-based productivity approach, has an impact on people's behavior globally regarding the demand for products with Green character itself and products resulting from Green (Handoko, 2020)-based production processes (Handoko, 2020)(Aminah & Yusriyadi, 2018).

Green industry / green industry is a term known through the International Conference on Green Industry in Asia in Manila, Philippines in 2009, in collaboration between the United Nations Industrial Development Organization (UNIDO), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP.), United Nations Environment Program (UNEP), International Labor Organization (ILO), and attended by 22 countries including Indonesia. One of the outputs of the meeting was the Manila Declaration on Green Industry in Asia (Yulfiah, 2018). This document is a joint commitment of countries in Asia in



efforts to address environmental problems through efficient use of resources and reduction of carbon gas emissions, especially in the industrial sector (Suzantho & Hadi, 2019).

Resource efficiency can be achieved by implementing 3R (reduce, reuse, and recycle) which is the core of cleaner production (Christiani et al., 2017). Low carbon can be achieved by implementing CO₂ emission reduction in line with the Clean Development Mechanism (CDM); energy efficiency and diversification in order to obtain renewable energy (Christiani et al., 2017).

In Indonesia, the Ministry of Environment and the Ministry of Industry are working together in an effort to create a green industry in Indonesia with the emergence of regulations related to industry and environmental impacts. In the work meeting of the ministry of industry in 2014 (Adbaidainya, 2021), the discussion regarding the arrangement of the Environmental Management (PLH) legislation was discussed. The principle of implementing a green industry is basically how an industry starts, processes and ends in an eco-friendly way, including processing in accordance with the Environmental Quality Limit – BML from the emissions or waste produced (Handoko et al., 2018).

The application of the green industry brings benefits to corporations, government and society (Grillitsch & Hansen, 2019), among others: Increasing profitability through increased efficiency so as to reduce operating costs, reduce waste management costs and additional revenue from by-products, improve company image, improve company performance, simplify access to funding, flexibility in regulation, opening up new market opportunities, preserving environmental functions.

Principles and Benefits of the 3R acronym – Reduce, Reuse, Recycle. A concept that is used for waste management / waste management so that it does not cause pollution. The principles of handling waste with 3R Reduce (reduce), Reuse (reuse), Recycle (recycling waste) and this principle has been continued with the 5R, plus Replace (replace) and Replant (plant back).

CONCLUSION

The Wonogiri batik industry in the production process has the potential to pollute the environment, especially the waters of the Gajah Mungkur reservoir. If this is allowed to continue, it will inhibit the formation of green industry in the area. It is known that the principles of the green industry include the minimum amount of pollution produced by a company. In order to prevent this, it can be done with good waste management, so that environmental pollution can be minimized.

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