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Original research

Batik Liquid Waste Management in the Batik Center Area of Tasikmalaya

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Abstract:
Batik production in Indonesia is increasing from year to year. However, regarding environmental quality, it is feared that it will produce waste that pollutes the surrounding water bodies. This study aims to describe problems and solutions in improving the management of batik liquid waste in the city and district of Tasikmalaya (Cipedes and Sukaraja) using descriptive qualitative methods and the Miles and Huberman model. The results of the research using interview and observation methods show that most batik SMEs in these two areas have been unable to manage waste optimally. The problem arising from batik liquid waste is the contamination of residents' fish ponds, sewers, and bathtubs. Although there are three independent and communal WWTPs (Wastewater Treatment Plants) in Cipedes (SMEs Agnessa, Deden, and riverbanks) as well as one independent WWTP in UMKM Sukapura "GJM," their utilization is still constrained by various natural and artificial factors. The role of the surrounding community is still low in understanding the existence and impact of batik waste around them.

Keywords: Management, Liquid Waste, Batik

Introduction

Batik is one of Indonesia's national cultural heritages that we should be grateful for from generation to generation. Since batik exports are one of the most important textile export commodities and a world heritage designated as an intangible property based on its aesthetic, artistic, and historical merits. Many Several batik businesses in Indonesia on a micro, small and medium scale, known as UMKM (Micro, Small and Medium Enterprises), are established from the production stage to the distribution of batik and usually come from the ancestral heritage of artisan families. Batik SMEs in Indonesia have an essential role in improving the national economy during the pandemic. Batik cloth is favored by several people from various backgrounds because of its uniqueness and artistic value. Various batik industries are spread in Indonesia, especially on Java Island, which cannot be separated from the origin of batik production from the Majapahit kingdom, Mataram, and the development of the Islamic religion of the archipelago. The story of batik has increased quite rapidly from year to year in various parts of Indonesia. Java Island has the most batik centers, with 2925 business units ranging from micro, small, and medium scale (Kemenperin RI & BPS, 2021). The popularity of batik cloth, which is the nation's cultural identity, continues to grow and cannot be separated from the historical and economic aspects of the country.

Batik cloth has historical and aesthetic values combined with various motifs and patterns. It can not be separated from the existence of dyes that are now increasingly diverse and various kinds of production techniques. The renewal of these two things began in 1856; synthetic dyes were introduced by William Henry Perkin, the Dutch who colonized Indonesia to produce batik cloth. The presence of synthetic dyes, which mainly contain azo dyes characterized by more contrasting and varied colors, has led batik artisans to abandon natural dyes derived from bark and tree branches. With the increasing demand for batik production, people have established various batik industries in several areas of the island of Java which later became the names of these types of batik such as Pekalongan batik, Surakarta batik, Yogya batik, Lasem batik, Cirebon batik, Banyumas batik, Lampung batik, and Sragen batik (Dewi et al., 2019; Fidiastuti et al., 2020; Fuji et al., 2020; Joko et al., 2015; Natalina & Firdaus, 2018). Each batik from various regions has its specific motif. So that the aesthetic value of batik cloth is influenced by the type of dye that is in line with the development of batik cloth production techniques in various regions.

Judging from the history of batik in Indonesia, the province of West Java has become one of the areas with the art of batik since the development of Sundanese culture. The emergence of batik in West Java dates back to the 11th and 18th centuries AD during the Sunda and Galuh kingdoms, who knew batik with the term "euyeuk" and was

written on Kawali inscriptions to the Batu Tulis. Batik in West Java has two batik motifs based on geographical location, namely Priangan batik spread in Tasikmalaya, Garut, and Ciamis and Coastal batik applied in Cirebon and Indramayu. The potential of Priangan batik, especially in the Central Batik City area and Tasikmalaya Regency (Cipedes and Sukaraja), makes it one of the centers of batik art in East Priangan. The Tasikmalaya handwritten batik has a distinct impression on its batik motifs, known as the Sukapura, Tasikan, and Sawoan motifs (Sunarya, Anas, & Syarief, 2011). The management of batik waste on a home scale is still lacking because the total production is small and the capability in terms of cost in waste management is still low. Most of the batik businesses in the batik center area of Tasikmalaya City are still at home and micro scale with the number of craftsmen ranging from 2-20 people. The waste water management system in the batik center area is mostly carried out by disposing of wastewater into drainage channels or ditches which mix with residents' domestic waste which eventually empties into the Citanduy-Ciloseh watershed (DAS). Even though there is a communal and independent WWTP in this area, considering the density of residents' settlements and the many home-scale batik businesses it has caused a number of problems, one of which was the contamination of the residents' fish ponds by batik waste water. Thus, the increasing amount of batik production is proportional to the volume of waste it produces.

The characteristic of Tasikmalaya batik motifs gives the meaning of simplicity, openness, and pluralism. The number of batik SMEs in the Cipedes and Sukaraja areas consists of 19 and 1 business unit and eight artisans dominated by medium-scale businesses or home industries. The production of batik cloth in these two areas amounts to 5-30 written batik cloths and 100-200 stamped batik cloths per month. So batik production in the batik center area of the City and Tasikmalaya Regency is one of the potential regional craft centers in developing the art of Priangan batik.

It is undeniable that batik has become the backbone of the economy for the people of the batik center area of the city and Tasikmalaya district. However, in the long term, it can worsen the quality of the aquatic environment due to residual production waste that is discharged directly into water bodies. Its existence is one of the potential sources of river and ditch water pollution around residential areas. The definition of waste is material produced from a natural process, either industrial or domestic, which is no longer needed for human life because its presence is not desired by the environment (Fajar et al., 2019). Based on its physical form, batik waste consists of liquid, solid, and gas waste. The presence of liquid waste has the highest percentage of the rest of batik production, which generally has a characteristic thick color and a slightly pungent odor of acidic or alkaline chemicals that come from the use of several production raw materials such as dyes. Based on the research results of several researchers related to batik waste, the water quality parameters of the liquid waste receiving bodies exceed the quality standards set in Government Regulation Number 05 of 2014 concerning the National Standard Wastewater Quality Standards (Muchtasjar et al., 2019; Noviar et al., 2019). So, the existence of batik liquid waste needs to be handled to minimize its negative impact on the environment.

With batik liquid waste management, efforts to minimize the negative impact of waste disposal on the aquatic environment are pursued. One is done by establishing a WWTP (Wastewater Management Installation). Definition a WWTP is a structure designed to remove biological and chemical waste from water to allow the water to be reused for other activities. Based on their utilization, WWTPs are grouped into independent and communal WWTPs (Suharto, 2011). The independent WWTP is a liquid waste disposal channel used for individual or family needs and generally has a simple structure. While the communal WWTP is a liquid waste disposal channel used for the needs of many people, and the scale is large (Hastutiningrum & Purnawan, 2017). Most batik business owners in these two areas dispose of waste directly into water bodies such as watersheds (Watershed Areas) and sewers through boiling, dyeing, and rinsing ponds.

Moreover, the existence of the WWTP's channel that has been made is not used optimally by residents. The purpose of this study was to describe the management of batik liquid waste in the batik center area of City and Tasikmalaya Regency. So that later the management of batik liquid waste in the two areas can be evaluated for its implementation by residents and the local Environmental Service.

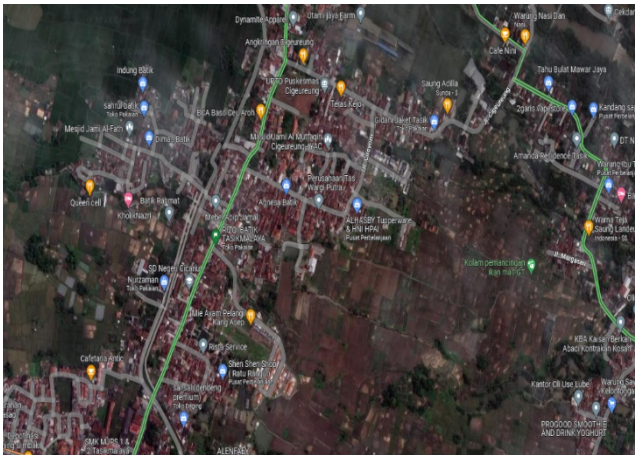
Material and Methods

This research was conducted in the Batik Center area of Tasikmalaya City and the Sukaraja Batik Center, Tasikmalaya Regency. Data collection techniques used in this study were observation and semi-structured interviews. While the sampling technique used is a purposive sampling of 38 respondents. Moreover, the participants in this study consisted of 1) primary informants, which included 19 owners of batik SMEs in Tasikmalaya City, one batik SME in Tasikmalaya Regency, eight home industry-scale batik artisans in Tasikmalaya Regency, 2) additional informants including the head of the RW (Rukun Warga) 10 Ciroyom and RW 11 Cigeureung, three residents of Ciroyom, two residents of Cicariu, two residents of Cigeureung along with 3) critical informants including one manager of a batik-making cooperative in the batik center area of Tasikmalaya City to gather information on the management of batik liquid waste in the two areas.

This research was conducted from January to March 2021. This research type is descriptive qualitative to describe problems in the management of batik liquid waste in the Batik Center Area of Tasikmalaya City (Cipedes) and Tasikmalaya Regency (Sukaraja). Data analysis techniques using the Miles and Huberman model include data reduction, data presentation, and drawing conclusions or verification (Sugiyono, 2013). The Tasikmalaya City Batik Center area, known as "Batik Village," is located in Nagarasari Village, Cipedes District, Tasikmalaya City, and has a distance of 4.6 km from the center of Tasikmalaya City. The batik business units in this area are spread over three villages, namely Ciroyom, Cicariu, and Cigeureung villages. The number of SMEs in the area is 19, most of which already have a SIUP (Trade Business Permit). The condition of the area has a picture of dense settlements drained by the Citanduy-Ciloseh watershed.

Moreover, the Tasikmalaya Regency Batik Center Area is located in Sukapura Village, Sukaraja District, Tasikmalaya Regency, 16 km from the city center. The batik business units in this area are spread out in Janggala and Sukapura. The number of SMEs in the area is 1 SME of Sukapura batik production house and eight craftsmen (home industry scale), most of whom already have a SIUP (Trade Business Permit). The condition of the area is still in the form of trees and residents' settlements which are relatively dense and flow by the Ciwulan River.

a



b

Figure 1. Location of the SMEs batik at the (a) Batik Center of Tasikmalaya City (Coordinat -7.3023906443078, 108.21884575434349), and (b) SMEs batik at the Batik Center of Tasikmalaya Regency (Coordinat -7.4512685490708925, 108.18874759117222)

Results and Discussion

Batik Liquid Waste Management at the Batik Center in Tasikmalaya City

The batik center area of Tasikmalaya City is located in Nagarasari Village, Cipedes District, Tasikmalaya City, which has 19 micros, small and medium-scale SMEs. Residents around most of their livelihood as entrepreneurs and batik artisans, as well as ornamental fish breeders and fish consumption. Based on the results of the study, it was found that residents who own 17 SMEs still dispose of batik waste directly into water bodies, such as ditches around residential areas and the Citanduy-Ciloseh watershed. It is because residents think that the

poison will disappear when the wastewater mixes with the river.

Meanwhile, SMEs owners Agnessa and Deden dispose of batik waste has been treated by independent IPAL, which has been provided as assistance by the government since 2012. Even one of the owners of SMEs Deden, Mr. Hj. Deden, said that the independent WWTP management was carried out by adding aerobic-anaerobic starter bacteria to the secondary treatment pond (active sludge). Furthermore, the characteristics of the added bacteria are unknown because they only think it is essential to add microbes so that the WWTP can function correctly. Several years ago, it was reported by residents and the head of the RW that there had been contamination of batik waste in local fish ponds, which caused the death of their fish.

Contaminated fish ponds are black and dark brown, increasingly emitting an unpleasant odor. Contaminated fish ponds are black and dark brown, giving off an increasingly unpleasant odor. In addition, based on research conducted by (Dewi et al., 2020; Siddiqui et al., 2011) , another effect that arises in polluted pond water is lower dissolved oxygen levels can indicate it in the resident fish ponds, which makes it difficult for fish to utilize oxygen for the growth and development process and is followed by an increasing rate of the anaerobic degradation process of local indigenous bacteria. So that most of the owners of batik SMEs prefer to dispose of their waste directly into water bodies without paying attention to the negative impacts, they will face in the future.

Most of the batik SMEs in the Tasikmalaya Batik Center are household scale whose manufacturing process is carried out in the backyard of the production house and integrated with the sales outlet. Batik production in this area provides a holding pond for boiling during washing and fixation (color attachment to batik cloth) and a final muddy reservoir before being discharged directly into the waters. Residents claim that the function of the dirty pool is to minimize the toxins from batik waste. The use of sludge is used as a biological treatment of batik liquid waste derived from microorganisms that grow naturally there (Suharto, 2011). Batik liquid waste contains physical, chemical, and biological parameters that exceed environmental quality standards (Kurniawan et al., 2014).

It can be seen from the physical characteristics of batik liquid waste when in the field; it has a distinctively pungent smell of ammonia, dark color when in a holding pond, and has an acidic pH which was measured directly by researchers using universal pH paper indicated will irritates when directly exposed to the hands of batik craftsmen. Craft artisans use cloth and plastic gloves when boiling, dyeing, and rinsing batik cloth. The dyeing process of batik cloth produces liquid and gaseous waste, which, when observed, the boiling smoke is very thick and stings when it comes into direct contact with the eyes. Disposing of batik liquid waste occurs from behind the yard of the production house and shop to the sewers and the Citanduy-Ciloseh watershed, as well as producing thick smoke, which is a potential source of air pollution in this area.

The utilization of the IPAL channel in this area has not been used correctly. The construction of a communal and independent WWTP was established in 2012 with the assistance of the West Java Provincial Government for 100 million rupiahs. The existence of two independent WWTPs at the UMKM, batik Deden, and Agnessa, are still being used, which are classified as on-site waste management. Meanwhile, a communal WWTP on the banks of the Citanduy-Ciloseh watershed, classified as a centralized waste treatment (off-site), has been neglected since 2013. It is due to several factors, such as floods breaking through the pipeline that connects the waste disposal channels of each SME and the human error factor that has not yet occurred. Understand how to maintain communal WWTPs, inadequate WWTP location placement, and theft of WWTP channel equipment such as Sanyo. The Tasikmalaya City Environment Service has facilitated the maintenance of WWTPs. Still, the residents do not have the will and interest because it is challenging to manage, and they do not understand how it works. The independent WWTP channel is made of concrete walls with a lid on top, which is given a controlling iron door measuring ±1.5 m x 1.5 m (Suharto, 2011). The aerobic process is usually used for wastewater treatment with a low BOD load, while the anaerobic process is used for a very high BOD load (Wulandari, 2014). Physical processes only carry out the waste treatment process using independent WWTPs in the form of bar, coarse and fine filters, chemical processes involving coagulation deposition and biological processes with the

anaerobic treatment of bacterial suspension cultures and sludge. Meanwhile, the sewage treatment process with communal WWTP is carried out by a series of physical, chemical, and biological processes from suspension cultures or microbial starters so that the use of independent and communal WWTPs in this area is still constrained in the management of batik liquid waste.

a b c

Figure 2. Location of the WWTP (Wastewater Treatment Plant) at the Batik Center of Tasikmalaya City (a) Communal IPAL on the outskirts of the Citanduy-Ciloseh watershed (b) independent WWTP in SMEs batik Deden, and (c) independent WWTP in Agnessa batik SMEs

Batik Liquid Waste Management at the Batik Center of Tasikmalaya Regency

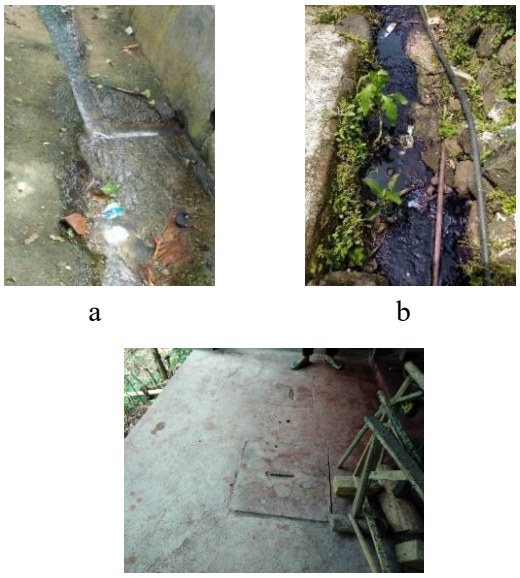
The Batik Center area of Tasikmalaya Regency consists mainly of micro-scale businesses where the production house and sales outlet are in the same place, and the number of artisans consists of 1-20 people. The batik production technique is in the form of hand-drawn batik and stamps with the original Sukapura motif that emerged from combining two royal cultures, namely the Mataram and Cirebon kingdoms. The inspiration for this batik style was plants, the environment, and the shape of the earth's surface. Based on observations and interviews, it was found that batik liquid waste was disposed of directly into ditches around residents' settlements without being processed first. The production of batik cloth produces 1-5 cloths per week, so residents consider the waste produced to be small and non-toxic to the environment.

The characteristics of batik liquid waste seen in the ditch are a very thick purple from the dye and the pungent smell of acid from the mordant. Furthermore, a stinging sensation in the eyes due to the thick smoke of boiling cloth, residents during the dry season, and the sewers emit a pungent stench. It is due to the breakdown of aromatic amine compounds in the azo group derived from batik dyes and decreased dissolved oxygen conditions, increasing nitrate production (Belladona et al., 2020; Hastutiningrum & Purnawan, 2017; Kurniawan et al., 2014). The case of batik waste pollution in fish ponds and bathtubs has never happened in this area. Residents do not have the will to manage batik liquid waste because they think there are not many batik industries. In addition, the artisans in this area have not applied the clean production principle because the raw materials still use chemicals and do not perform 3R (reuse, recycle, and recovery) in using resources and energy in the production process. Thus, batik production activities in this area still use chemicals, and batik liquid waste is disposed of directly into sewers which can be seen from its physical characteristics during observation.

Sukapura village, the location of the batik center of Tasikmalaya Regency, is a potential center for batik art in supporting regional economic growth but does not yet have an adequate batik waste management system. Several residents and owners of SMEs in this area claim that from the past until now, there has never been any contamination of batik waste in people's homes because the waste produced is tiny, comparable to the amount of batik cloth production. The existence of an independent IPAL channel in this area is only found in the SMEs Batik Tulis Sukapura "GJM" in the form of assistance provided by Bank Indonesia since August 2, 2019. The independent IPAL channel with closed piping is made with a depth of 2.5 meters, and the waste from the pipe is colorless. Furthermore, the owner of the SMEs, Mr. Edang, said that the effluent waste once flowed from the gutter to the banana tree in the garden behind his house and had no effect on the growth of the trees. So he considers his independent WWTP to be effective in reducing the negative impact of batik liquid waste. The waste treatment process at the Sukapura SMEs "GJM" is not much different from the independent IPAL at the Deden and Agnessa batik SMEs which utilizes a physical

process with a bar filter and a biological process using microbes and sludge. In the wastewater treatment process, there are several quality parameters used. The quality parameters can be grouped into 1) organic parameters in the form of the number of organic substances contained in the waste, such as Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), oils and fats (O&G), and Total Petroleum Hydrocarbons (TPH), 2) physical characteristics in the form of visible waste such as color, odor, temperature, and reduction potential, and 3) biological characteristics in the form of specific contaminants in the form of organic and inorganic compounds such as local indigenous microbes (Belladona et al., 2020; Fajar et al., 2019). The construction of communal WWTPs in this area has not yet been announced because it requires significant investment and high operating costs. In addition, judging from the background of the livelihoods of residents, the majority of whom are batik artisans, animal breeders, and farmers, it is predicted that it will be difficult to finance the management of the WWTP to be complicated. So that the management of batik liquid waste in this area is not entirely optimal because there is only one SMEs with a simple independent WWTP. Furthermore, no communal WWTP manages batik effluent produced by eight household-scale and conventional artisans.

Based on the results of interviews conducted with 20 respondents of Batik UMKM in the batik center area of Kota and Tasikmalaya Regency, it was found that they did not have the knowledge, expertise, and financial ability to provide batik liquid waste treatment. In addition, they also claim that batik liquid waste exposed to a mixture of river and sewer water can decompose the pollutant itself. However, the degradation process naturally occurs for a long time and instead creates other new sources of pollution (Oktaviani, 2018). The treatment of batik liquid waste suitable to be applied is a technology that is easy to maintain and has low operating costs. The batik artisans in these two areas have the idea that batik liquid waste, in the long term, can interfere with the quality of the waters of the surrounding residents but is constrained by the cost of fabric production. It ultimately requires external assistance from the government and the private sector in physical programs such as maintenance of communal WWTP WWTP and non-physical program such as coaching people to increase knowledge, expertise, and institutional organization of batik SMEs. In addition, a collaboration between residents, the kelurahan, and the environmental service has not been appropriately realized. It is due to the lack of community initiative in handling batik liquid waste. So, it is necessary to conduct socialization and regular meetings between local people and sub-districts to discuss plans for improvement in the management of batik liquid waste in these two areas.



a b c

Figure 3. The sewerage of batik liquid waste at the Batik Center, Tasikmalaya Regency (Sukaraja) (a) Bu Uun's traditional hand-drawn batik which is a household scale; (b) Pak Uyung's stamped batik using synthetic dye of purple naphthol salt and dumped directly into the sewer; and (c) WWTP (Wastewater Disposal Installation) at the Batik Tulis Sukapura "GJM" UMKM

Efforts to Improve Batik Liquid Waste Management

Management of batik liquid waste is needed to minimize the toxicity of batik liquid waste to water bodies around residents. The batik liquid waste disposed of directly into water bodies without treatment will negatively impact the quality of the environment and the health of local residents. The purpose of waste treatment is to reduce the content of contaminants such as suspended solids, pathogenic microbes, and organic compounds that natural microorganisms cannot decompose. Article 5, Law

Number 03 of 2010 concerning Wastewater Quality Standards for Industrial Estates stated that everyone is allowed to dispose of waste into environmental media with the requirements of meeting the quality standards of the environment. Quality standards and obtaining permission from the Minister, Governor, Mayor, Regent, or local government (Menteri Lingkungan Hidup RI, 2010). However, the batik wastewater management that has been carried out so far has not yet reached the stage of thinking about handling or recycling waste. Handling of waste that has been carried out only curatively, namely by treating wastewater discharged into the environment (Hafidh et al., 2016). The management of batik liquid waste in various other areas is still not much different from the maintenance and financing aspects. Until now, no recycled batik liquid waste has been helpful for the sustainability of its production. Thus, it is necessary to improve the handling of batik liquid waste.

Various efforts must be made to improve the management of batik liquid waste in this area from various aspects of life. From the social aspect, establishing a community of environmentally friendly batik craftsmen or an environmentally friendly batik village that organizes payment of WWTP management fees is necessary to increase efforts to manage batik liquid waste. However, until now, residents still have no initiative to pay the levy fees for the maintenance of WWTPs. It is different from other areas, such as the communal WWTP for household waste in Mendak Girisekar, Panggang, and Gunung Kidul, where the residents have a high initiative to maintain the communal WWTP because they are aware of the negative impacts of household waste (Hafidh et al., 2016). From the economic aspect, integrating funding sources from the government, batik producers, and the community is needed to maintain IPAL, handle batik waste, and improve the quality of batik production in the batik center area of Kota and Tasikmalaya Regency. From the management aspect, regulations, policies, and planning programs for batik wastewater management are needed as well as capacity building and solid and intensive coordination according to their authority in the activities of the production process, wastewater management and institutions in these two areas (Kurniawan et al., 2014). Standards for managing textile waste water have not been regulated in regional regulations, but still refer to the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 16 of 2019 regarding changes to the appendix of quality standards for wastewater quality in the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 5 of 2014 which stipulates the quality standard for the quality of wastewater discharged into the environment must meet the quality standard. From the technical aspect, maintenance of the WWTP channel requires sustainability involving the participation of the community in order to overcome the ineffectiveness of batik waste management caused because the number of available WWTPs is inversely proportional to the capacity of batik waste for each day (Fajar et al., 2019; Indrayani and Triwiswara, 2018). Currently, the existence of WWTP in this district has not been maximized in the management of batik business waste water which converts into homes and is only used by micro-scale businesses such as Deden batik SMEs and Agnessa batik SMEs. From the legal aspect, the administration of punishment (sanctions) and rewards (awards) by the government to the owners of batik SMEs in the management of batik liquid waste needs to be held in this area in order to increase public awareness about the dangers of batik liquid waste that is disposed of directly without being processed. Thus, various efforts can be made to bring up citizen initiatives in managing the use of WWTPs and handling batik liquid waste which is expected to create a sense of ownership among local residents in the future.

Conclusion

The management of batik liquid waste in the Batik Center area of Tasikmalaya City (Cipedes) and the Batik Center Area of Tasikmalaya Regency (Sukaraja) has not been optimal. It is evident from the neglect of communal WWTPs in Cipedes and the large amount of wastewater that flows into the sewers of residential residents in Sukaraja. It is caused by several factors, such as natural factors (natural disasters such as floods which caused the breakdown of the pipe connecting the IPAL channel for several SMEs). And artificial factors (the loss of the WWTP Sanyo pump and the lack of interest and understanding of residents regarding the maintenance of WWTP and batik waste). Although

the number of SMEs in Sukaraja is relatively tiny, at least a simple independent WWTP management is needed to promote an environmentally friendly industry and not endanger residents.

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Conflict of Interest
The authors have no conflicts of interest to declare.

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