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Article

Conserving Indonesia's nature and culture through empowerment of indigenous technology in creative industry SMEs

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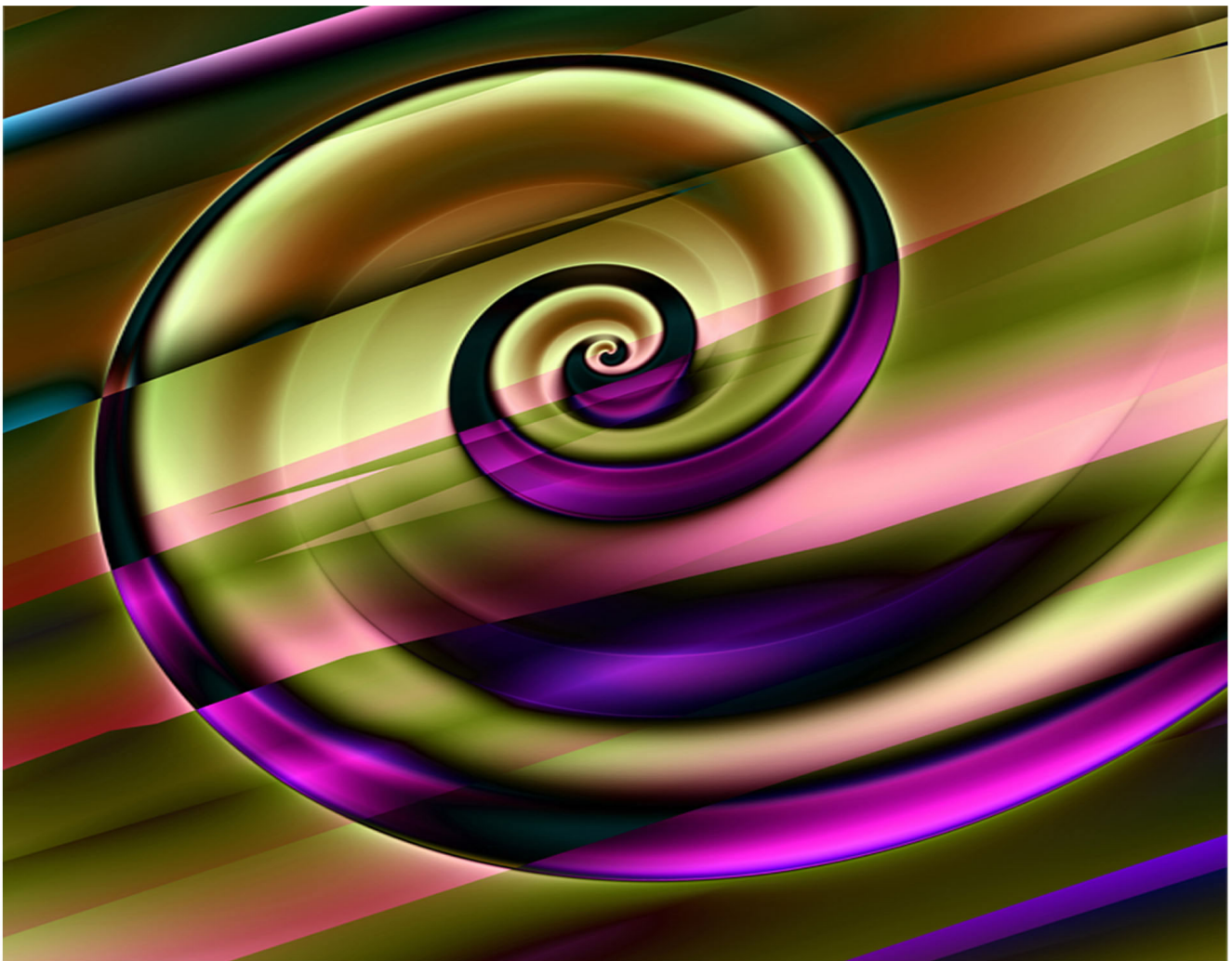
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**CONSERVING INDONESIA'S NATURE AND CULTURE THROUGH EMPOWERMENT OF
INDIGENOUS TECHNOLOGY IN CREATIVE INDUSTRY SMEs**

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ABSTRACT

Nature and culture are both unique potential that Indonesia can promote to face the global market. Small and Medium Enterprises (SMEs) gives big contribution to Indonesia's Gross Domestic Product (GDP). One of the most contributing kinds is *batik* fashion design creative industry *SME*. Indonesian *batik* is a masterpiece of cultural heritage in humanity. Natural dyes *batik* industry brings major impact to economy and environment. Eco-friendly batik SME that utilise natural resources is one of the ways of conserving nature and culture. This paper would provide an environmental approach of analysing indigenous technology used to produce batik and the natural dyes involved. To achieve the goals, case study and SWOT analysis will be used. The outputs of this paper are to collect information and suggest optimisation of indigenous technology in order to conserve nature, culture and preparing Indonesia for the AFTA and AEC.

Keywords: *batik* fashion design creative industry SME, natural dyes, indigenous technology

1 INTRODUCTION

To increase the Southeast Asia region's competitiveness for the world market, the ASEAN Heads of State and Government established ASEAN Free Trade Area or AFTA in the year 1992 (ASEAN Secretariat, 1999). The ultimate target of AFTA is Zero Tariff Rates. To achieve the target, the members are now working on total elimination of import duties on all products. This ultimate target is planned to be achieved in 2015. Other than AFTA, ASEAN is also preparing something else for the year 2015, which is ASEAN Economic Community or AEC. This community is destined to be the goal of regional economic integration of Southeast Asian countries. The characteristics of this community are single market, production-based, highly competitive economic region. Both AFTA and AEC are Southeast Asia's efforts on improving ASEAN countries in the economical aspect and increasing ASEAN chances in the world's market. These efforts also facilitate each of the ASEAN country to bring out its own potential to the world.

In order to face the upcoming challenge of AFTA and AEC, the nations must prepare their own potential to increase its competitiveness. Indonesia, being the world's largest archipelago, has various cultural heritages and biodiversities vastly distributed along its regions. Indonesia is home to a biodiversity that is only second to Brazil (Coordinating Ministry for Economic Affairs RI, 2011). It's predicted that 60% of the world's flora species are located in Indonesia. According to the data of Indonesian institute of sciences (LIPI), there are 8000 types of plants identified in Indonesia (Putra, 2013). This is one of the examples of the wealth of potential that this nation has. Other than that, there are over 300 different ethnic groups in Indonesia (Kuoni, 1999). Each of the ethnic group has a culture that brings out their own uniqueness. Both culture and natural resources are our potentials that we can offer to the international market.

Aside from all the potentials, Indonesia is still facing major problems in the economical aspect. International Monetary Fund data (IMF, 2012) shows that Indonesia's Gross Domestic Product (GDP) per capita is \$ 4,977, which is ranked 5th out of 10 countries of Southeast Asia. This proves that though Indonesia is a prosperous country based on its potential, its prosperity is not shown in the economical aspect of the international market. This issue shows that Indonesia is not optimising its potential very well.

According to the central agency on statistics data (BPS, 2013), Small and Medium Enterprises (SMEs) contributed 56% of the Indonesia's GDP. The number of SMEs which is 55.2 million also contributed in eliminating unemployment in Indonesia. Being a country with 246.9 million population (BPS, 2012), Indonesia is also facing

the problem of unemployment. The SME is using around 97 of total Indonesian manpower, which more than 100 million people (Republika, 2013). This proves that SME plays a great role in improving a lot of aspects in Indonesia. One of the contributing kinds of SME is the creative industries. Creative industries defined as industries which have their origin in individual creativity, skill and talent. These industries have a potential for wealth and job creation through the generation and exploitation of intellectual property (DCMS, 1998). Fashion design creative industries contribute 44.3% of the total contribution in creative industries. Hence, one of the potential that we should improve in Indonesia is fashion creative industry SMEs.

Indonesian *batik* is inscribed by UNESCO in 2009 on the Representative List of the Intangible Cultural Heritage of Humanity. It is noted that *batik* is one of the unique cultural heritage that contributes on our fashion creative industry sub-sector. Aside from the benefits of *batik*, there are several weaknesses as well. One of the problems that *batik* has caused in this country is the waste produced. *Batik* wastewater has caused negative impacts in the environment. The usage of synthetic dyes will contribute a great number of chemical oxygen demand or COD in the water (Subki and Rohasliney. H, 2011). Besides COD, there are also a few of hazardous chemical structures contained in the synthetic dyes (Kirby, 1945) which can pollute the water bodies and also affect the workers of this sector.

Nowadays, the global environmental issue is “Go Green”, which is why the global market not only sees the product for the result, but the process as well. It is the reason why most of the businesses all around the world are now trying to be more environmental friendly. However, deducing from the problems of the waste of *batik*, Indonesia has not concerned about this yet. Most of the *batik* manufacturing industries are still using synthetic dyes. This problem limits us from optimising our *batik* potential. We have not realized that working on the environmental aspect of a business enhances our strength in the global market. The key solution for this problem is to create an eco-friendly *batik* enterprise. The utilisation of natural dye is the key of creating an eco-friendly fashion industry SME. The natural dye is our way of optimising the use of our natural resources and cultural heritage as our potential on facing the global market.

The aim of this research, which is based on a case study in one of the *batik* SME in the Special Region of Yogyakarta Province, is to collect information and suggest optimisation on indigenous technology in order to conserve nature, culture and preparing Indonesia for the global market. The specific research objective is to analyse indigenous technology used to produce *batik* and achieve better understanding for the natural dyes used for the process, environmental effect, economical and social impact of this SME.

2 RESEARCH METHODS

To achieve the objectives of the research, deductive forming was used. The idea began with fashion creative industry SME and grew specifically to eco-friendly *batik* SME that used natural dyes in the processing. This research used case study on one of the *batik* SME in Special Region of Yogyakarta Province, which is for this research will then be called ‘*Batik X*’. This particular SME was chosen because of the following reasons: (1) ‘*Batik X*’ is one of the *batik* SME that utilises natural dyes, (2) ‘*Batik X*’s founder, Hendri Suprpto, is also an expert consultant of natural dyes and the founder and leader of *Gerakan Warna Alam Indonesia* and (3) This SME has raised its level to the international market which showed that it can be the example of how to expand small and medium enterprises to the international market.

The sampling strategy used for this qualitative research was purposive sampling, specifically expert sampling (M. Given, 2008) which is case that will produce critical information on the use of natural dyes in *batik* SMEs. This research used observation and interview as methods of the data collection employed. The interviewee was chosen based on the criteria used for sampling, which was an expert on natural dyes who runs business on *batik* SME. Validity of the results was assured by literature review on relevant studies in natural dyes colouring.

3 RESULTS

3.1 History and philosophy of *batik*

The word *batik* is derived from Javanese word '*amba*' means 'to write', the suffix, '*titik*' means little dot or 'to make dot'. In manuscript of a *lontar* leaf originated from 1520 AD which was found in Galuh, Southern Cirebon, it is written that *batik* also means '*seratan*' which means 'writing' (Ministry of Trade of the Republic of Indonesia, 2008). Resource person defined *batik* as Indonesian's indigenous masterpiece of crafts and art that is produced using wax as *perintang* or covering compound with a tool called *canting* or stamp. Any creation aside from that definition is classified as textile with *batik* patterns.

Batik is a unique Indonesian character that other country will not be equalled to. Each *batik* pattern from different regions of Indonesia has its own philosophies. In the Javanese culture, *batik* symbolizes a philosophy of the importance of life, cycle of birth, marriage and death. *Batik* plays a great role in each milestone in a person's life. Javanese babies are wrapped in *batik* when they born, dressed in *batik* when they get married and later on the bodies covered in *batik* during funeral.

Most of the *batik* patterns are taken from the nature, such as leaves, flowers, mountains, water, animals and clouds. Each of these patterns represent either mystical or religious symbols which are related to early beliefs of Indonesian people and later on to Hinduism as the early religion that was propagated in Indonesia.

Traditionally, *batik* was sold in 90 x 250 cm lengths for wrap skirts. But nowadays, *batik* is sold in other different types of clothing product, furnishing fabrics, heavy canvas wall hangings and other household accessories. Another development of the technology is the production of textile *batik* using modern machinery. This process is considered to be easier to produce, low cost and quick compared to the traditional *batik*. However, this development affects hand-drawn and stamped *batik* in the market. Factory textile *batik* is much cheaper than the traditional *batik*. This is the cause that changes people paradigm about *batik*. Most people think that *batik* is a pattern, not the process, but based on the definition, it is otherwise.

3.2 Traditional *batik* processing

Raw materials that are being used for *batik* processing in this case study are cotton or silk fabric and natural dyes. The *batik* manufacturing process begins with the pre-treatment or mordanting using alum or potassium aluminium sulphate ($K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$). In this process, the fabric soaked in water combined with alum for one hour which would enable the alum to enter the fabric. Alum is a fixative dye compound, which would later on, binds the dye to the fabric. Afterwards the fabric is washed with water and dried.

After the pre-treatment, the process continues with designing the fabric. The design of *batik* is full of philosophies and culture. Each region of Indonesia has their own design which reveals stories of its cultural heritage. The design of the *batik* will then undergo waxing process. Waxing can be done by hand-drawn, stamped or combination of both. Hand-drawn waxing uses traditional tool called *canting*. The process will take up to two weeks time for one fabric with the size of 90 x 250 cm. On the other hand, stamped waxing process will only take a few hours. Stamped waxing is done using stamping tools that provide different motives of *batik*. Waxing can also be done using combination of both techniques. After the fabric is being stamped, we use *canting* to hand-write it.

After the wax cooled off the colouring process can be conducted. The fabric is dipped 3-4 times to the container filled with natural dye. The fabric would then left to dry by itself and the wax can be removed. The last step of the *batik* processing is fixation. Fixative solution is used during this process to once again fixate the colour of the *batik*. There are three types of fixative solution: alum, *tunjung* and *kapur tohor*. Selection of the fixative solution is based on the natural dye that is being used. One type of natural dye called indigofera is using different type of fixative solution, which is vinegar or lime or *belimbing wuluh*. The process ends with drying the fabric.

The whole process for handwritten *batik* for one fabric will take around 2-3 weeks. On the other hand, for stamped waxing, one day process will be enough to produce seven different fabrics. The process diagram can be seen in Figure 1.

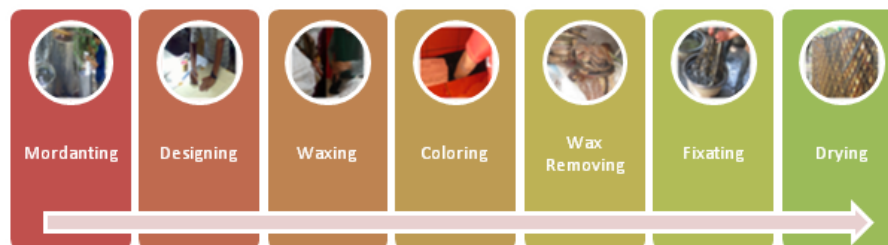


Figure 1: *Batik* making process in 'X *Batik* SME' (Source: *Case Study*, 2014)

3.3 Natural dyes and synthetic dyes

3.3.1 History of dyes

The first period of dye history occurs before the year 1856. During this period, countries around the world were using natural dyes to colour textile. The natural dyes were generated from plants, animals and minerals. In this period, natural dyes still had lots of weaknesses. The colouring process took 20-30 times dipping, the colour was monotone, could not be reproduced with the same colour, unstable, fungi can be easily found during storage and it cannot be mass produced.

To overcome these weaknesses, researches were being held to substitute natural dye to synthetic ones. Researchers imitated chemical structures of colouring compound in the natural dyes to produce dying compound that can be more practical, stable, can be mass produced and have widely varied colours. In 1856, an English chemist, William Henry Perkins, discovered the first synthetic dye named purple aniline. This dye was practical, it took only 2-3 times dipping, varying in colour, stable and can be mass produced. The results of research, followed by other researches, were widely introduced in the global scale, including in Indonesia by the colonial. The colonial suggested the use of synthetic dyes in Indonesian fashion industry, including the traditional *batik* and *tenun*. Considering the fact that people from that era could not overcome the weaknesses of natural dye, they easily accepted the suggestion and started using the synthetic dye.

The researches on the subject of dye developed through time and discovered other synthetic dyes such as naphthol, indanthrene, direct and indigo sol. Most of the synthetic dyes contained azo compound. Azo is a carcinogenic compound that will affect human body after ten years period. This compound will spread through epidermis and oral. The danger of this compound was revealed in the year 1995, causing a beginning of a new era in dyes. In June 1995, a conference was being held in Geneva about eco-labelling. One of the decisions being made in the conference was the prohibition of the use of synthetic dye using azo compound.

After the conference, the Netherlands government sent a letter to Indonesia that banned the use of synthetic dyes in Indonesia. Research was being held in Indonesia in order to find a solution for natural dye problem. Researchers found that the structure of natural dye in plants contained 40% alum. If the level of alum increased then the dye will be more fixated. The alum was contained in *tawas* or $K_2Al_2(SO_4)_2$. The technology needed in order to fixate the dye is called 'mordanting' using fixative agent. This technology will overcome the weaknesses of natural dye which were found in the first period. After the formula was discovered and the technology was ready for use, the prohibition letter was being distributed to the Indonesian citizen along with the solution that the government of Indonesia offered. The government suggested going back to the use of natural dye, along with mordanting process. The effort was not that easy. Because Indonesians have been using synthetic dye for more than one hundred year, it was almost impossible to change their paradigm about the natural dyes in a short period of time. Up until now most of the Indonesian people are still using synthetic dyes.

In the year 2010, there was a global environmental issue of 'Go Green' which means that all of the businesses have to be developed in the environmental aspects or 'Green Industry'. This causes the international market and some local market viewed an enterprise not only from the product, but from the process as well. The market chose a business that is more environmental friendly. That is why in this year, the effort to campaign the use of natural dye was being optimised. Hendri Suprpto, a consultant in natural dyes, established a community called *Gerakan Warna Alam Indonesia* or WARLAMI. This community's goal is to persuade the use of natural dyes in order to save the environment. There were a few numbers of training being held for different regions around Indonesia and a few enterprises have joined this community.

To sum it up, there are four periods of the dyes. The first period take place before 1856 was the period of the use of natural dyes with traditional technology. The second period, which was from 1856 until 1995, was the use of synthetic dyes. The third period, the year 1995 until 2010, was the use of enhanced traditional technology of natural

dyes. The fourth period which occurred from 2010 up until now was the period of Go Green, where the effort of persuading the use of natural dyes in Indonesia was being maximized.

3.3.2 Types of natural dyes and extraction process

Natural dyes that were being used for this SME are *secang* tree (*Caesalpia sappan L.*) for red colour; *tingi* tree (*Cheriops tagal*) for red colour; rind of *jalawe* fruit for yellow colour; *mahagoni* tree (*Swietenia mahagoni*) for pink colour; indigofera leaf paste for blue colour; *tegran* (*Cudraina javanensis*), root bark of *mengkudu* (*Morinda citrifolia L.*) for red colour; and *soga*, which is combination of *tegran*, *tingi* and bark of *jambal* tree, for brown colour.



Figure 2: Sources of natural dyes used in 'Batik X' SME (Source: Case Study, 2014)

The extraction process for each of the natural dye is simple. The plant is being boiled in water for an hour and then filtered. The product for one extraction process can then be used for a week for a few *batik* colouring. Extraction for indigofera is different. The leaves and branch of indigofera is cut, bound together and soaked one day for fermentation process. The next day, it is being aerated and *kapur tohor* is being added to the water to bind indigofera's colouring agent, indigotin. The fixative dye would then react for one day and being filtered afterwards. This process would result in a form of paste. A reducing agent of brown sugar would then be added for a whole day to reduce the indigotin so that the paste is ready for use.



Figure 3: Extraction process of natural dyes in 'Batik X' SME (Source: Case Study, 2014)

3.3.3 Advantages of natural dyes

According to the resource person, each of the process of *batik* processing with natural dyes does not produce any hazardous waste. Pre-treatment or mordanting is using *alum* which is normally used for water treatment. The waxing process is using wax that is formed with pine tree latex, white wax, *Agathis dammara* tree, fat and paraffin. The wax can be reused by heating it so that it would be fluid again. The colouring process is using natural dye which was generated from plants, so the wastewater does not cause any damage to the environment. The SME is using landfill process for the wastewater so that the solid residues from the wastewater can be used as fertilizers. Compared to synthetic dyes wastewater with high level of COD and hazardous compounds, natural dye is very environmental friendly.



Figure 4: (Left) 'Batik X' – natural dyes wastewater, (Right) Batik - synthetic dyes wastewater (Source: Case Study, 2014)

Another advantage of using natural dyes is that they have their own uniqueness compared to the synthetic ones. While the synthetic ones have standardized colour, natural dyes colour is affected by a lot of different aspects. The natural dye is affected by harvesting age, type of vegetation and soil structure. It is proven that the colour is also more relaxing and healthier for the eyes compared to synthetic ones. The uniqueness of natural dyes makes it easier to promote it to the global market.

Natural dyes traditional *batik* is usually more expensive than fabricated ones. The price varies from Rp 150.000 – Rp 10.000.000. Moreover, resources for natural dyes come from the nature such as trees, which can be planted and harvested several times. Organic waste generated from plants such as fallen leaves can also be used. Therefore the use of natural dyes is very much align with the 3R campaign of reduce, reuse and recycle.

Natural dyes have their own uniqueness that has been proven to attract buyer from the international market. Most of the consumer of ‘*Batik X*’ comes from other countries. Countries such as Japan, Australia, Malaysia, and European countries have put their interest on this SME. *Batik X* has attended several international exhibition and conferences to promote natural colour *batik* of Indonesia. This brings positive impact to economic and social aspects of this SME.

4 DISCUSSION

By reviewing the definitions of *batik*, it is stated that indigenous technologies used to process *batik* are the essential aspect of the *batik* itself (Ministry of Trade of the Republic of Indonesia, 2008). Nevertheless, development of technologies such as fabrication and synthetic dyes changed most people’s paradigm about *batik*. Nowadays, people have their own mindset that *batik* is a pattern, not a process. This paradigm makes most of the *batik* enterprises changed their indigenous path to the modern and much simpler ones which are the fabricated or the synthetic dyes. However, the uniqueness of Indonesian *batik* that other country will not imitate is the cultural character and indigenous technologies being used. According to the resource person, that is what makes *batik* so special and attracts more buyers in the international market.

It was stated that the history of dyes also revealed how dangerous it is to use synthetic dyes. The problem is that most of the enterprises in Indonesia are still using synthetic ones. Indonesia has not realized its potential on its natural resources yet. Most of the resources needed to produce natural dyes are available in Indonesia. It is predicted that there are two millions species of flora in the world that have been identified and 60% of which exist in Indonesia (Coordinating Ministry for Economic Affairs RI, 2011). This condition can be possible because of Indonesia’s climate. The areas along the equatorial belt experience hot and humid weather along with excessive rainfall which provides ideal growing conditions for vegetation (Putera, 2013). Hence, tropical country has more advantages than other countries when it comes to natural resources. The problem is that the people have not optimised its utilisation yet. It is not about depleting natural resources, but conserving them by creating sustainable cultivation system that will maintain the resources.

The results also prove that natural dyes can be the answer to *batik* wastewater problem. Indonesian *batik* industries are now experiencing the problem of high level of chemical COD in wastewater, due to the chemical compounds used in the synthetic dyes (Emat, Arif Roh. 2013). To fix the problem, what most of the industries are working on right now is generating a wastewater management system, such as coagulation, flocculation, aerobic and anaerobic biological treatment to reduce its chemical oxygen demand so that it is suitable for the quality standards. These wastewater treatments are complex and needs a lot of money to build and maintain. On the other hand, if natural dyes are being used, there will be no problem on its COD. Hence there is no need to create expensive wastewater treatments. Since the resources itself are mostly generated from the nature, the wastewater will not cause any damage to the environment. Moreover, global markets are now looking for green industries and they will choose the product that is more environmental friendly. This is also an advantage for Indonesia if we are using natural dyes in our *batik* processing.

By analysing the results, SWOT analysis can be done for *batik* SME that uses natural dyes. The strengths are: (1) this business can be conducted for all regions of Indonesia, since each regions have its own character of *batik* and types of natural dyes resources, (2) more environmental friendly, so the enterprise will save money for wastewater management and (3) the richness of cultural character and uniqueness drawn more interest and increases its marketability in the global scale. While the weaknesses identified are: (1) the processes of indigenous technologies are longer than the fabricated ones, (2) no standardization for colours in natural dyes and (3) a few of Indonesian SMEs are still facing difficulties in marketing their products on a global level. The opportunities faced by *batik* SME in Indonesia are: (1) Indonesia has more natural resources for natural dyes compared to other countries due to its biodiversity and (2) the global concern in environmental issue is increasing, hence natural dyes

are more preferable compared to synthetic ones. On the other hand, the threats are: (1) local market has more interest in the fabricated *batik* since it is cheaper and Indonesian's have low knowledge on natural dyes and cultural values of *batik*, (2) certain neighbouring country of Indonesia claimed *batik* as their own cultural heritage and (3) other countries are putting interest in developing the use of natural dyes at their own regions, so there will be more competition in the global market.

Though a few weaknesses and threats are found, there are solutions to overcome them. In facing the high demand of the market, the long process of *batik* can be managed if there are lots of *batik* SMEs working together. With big number of workers, the amount of products can be increased. Lack of standardization in colour is something that makes the natural dye unique on some level which could increase its marketability. WARLAMI as a community that supports the use of natural dyes can help the marketing effort of each SME and support them to get to an international exhibition. In a local scale, WARLAMI together with the *batik* SME can socialize the cultural values of *batik* to the Indonesian people as well as highlighting the need to use natural dyes in *batik*. The local market's interest in fabricated *batik* can be handled by putting more knowledge in Indonesian people about the cultural heritage so that Indonesian would support this SME. *Batik* is an Indonesian trademark and what differentiate it from other countries is that it has rich character and cultural background behind it. Indonesia also should not put worry about other countries that are developing natural dyes, because Indonesia is the country with the largest number of resources and our fashion design creative industry has something that other countries cannot offer, which is a character of its own.

In order to optimise this effort, the government has to play their role. Trading sector of Indonesia can establish regulation on putting labels on natural dye products so that people can easily identify *batik* with natural dyes. There should be collaboration with the agricultural sectors to support the plantation of natural dye-producing plants. Meanwhile the effort to ensure the sustainability of *Batik* as a cultural heritage can be done by incorporating comprehension of *batik* and its philosophies into the education of Indonesia's children. Hence, the next generation of Indonesian people will have more understanding and interest on cultural values from the early age.

5 CONCLUSION

The use of indigenous technology and natural dyes in fashion design creative industry SMEs in Indonesia is one of the answers in facing the global market. Optimisation in indigenous technologies will bring out our potentials and increase the marketability of our products in the global market. In order to face the AFTA and AEC, not only do we have to conquer the global market, but we have to synergize the local market as well. This particular effort of conserving nature and culture can be optimised by socializing this to Indonesian citizen so that we can work together to one successful outcome and Indonesian people will give more appreciation to the local product. Another solution is to create a massive sustainable cultivation system for the natural resources needed for natural dyes. With these efforts, hopefully Indonesia could preserve their nature and cultural heritage as well as excel in the free trade area of Southeast Asia.

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2. REFERENCES

- ASEAN Secretariat, 2008. *Asean Economic Community Blueprint*. Available via <<http://www.asean.org/archive/5187-10.pdf>> [accessed July 29, 2014].
- ASEAN Secretariat. 1999. *Asean Free Trade Area (AFTA): An Update*. Available via <<http://www.asean.org/communities/asean-economic-community/item/asean-free-trade-area-afta-an-update>> [accessed July 24, 2014].
- Coordinating Ministry for Economic Affairs RI, 2011. *Natural Resources*. Available via <<http://www4.bkpm.go.id/contents/general/7/natural-resources#.U9EfOEATEcI%20%28>> [accessed: July 24, 2014].

- Emat, Arif Roh. 2013. *Mutu Air Limbah Home Industry Batik di Kelurahan Laweyan, Surakarta*. Available via <<http://eprints.uns.ac.id/13371/>> [accessed July 28, 2014]
- Kirby, A.H.M. 1945. *Studies in Carcinogenesis with Azo Compounds*. Glasgow: The Research Department, The Glasgow Royal Cancer Hospital. Available via <cancerres.aacrjournals.org/content/5/12/683.full.pdf> [accessed July 25, 2014]
- M. Given, Lisa. (Ed.). 2008. *The Sage Encyclopedia of Qualitative Research Methods*, Vol. 2, 697-698. CA: Sage, Thousands Oaks.
- Ministry of Trade of the Republic of Indonesia. 2008. *Indonesia Batik: A Cultural Beauty*. Available via <www.kemendag.go.id/files/pdf/2012/12/08/batik-id0-1354950532.pdf> [accessed July 26, 2014]
- N.S, Subki and H. Rohasliney. 2011. *A Preliminary Study on Batik Effluent in Kelantan State : A Water Quality Perspective*. Available via <psrcentre.org/images/extraimages/1211596.pdf> [accessed: July 25, 2014]
- Patton, M.Q. 2001. *Qualitative Evaluation and Research Methods*. 3rd ed. Newbury Park, CA: Sage Publications
- Putra, Yudhi S. 2013. *Inventory of Pathological Microbial Biodiversity Endemic in Indonesian as the Framework for Protecting Valuable Assets Biological Agent for Better Progress of Indonesia Medical Research*. Available at <<http://m.kompasiana.com/post/read/585878/3/inventory-of-pathological-microbial-biodiversity-endemic-in-indonesian-as-the-framework-for-protecting-valuable-assets-biological-agent-for-better-progress-of-indonesia-medical-research.html>> [accessed July 31, 2014]
- Republika News. 2013. *UMKM Serap 97 Persen Tenaga Kerja di Indonesia*. Available at <<http://www.republika.co.id/berita/ekonomi/mikro/13/07/03/mpcpxl-umkm-serap-97-persen-tenaga-kerja-di-indonesia>> [accessed July 29, 2014]
- Sianita, D. & Nurchayati, I.S. *Kajian Pengolahan Limbah Cair Industri Batik, Kombinasi Aerob-Anaerob dan Penggunaan Koagulan Tawas*. Available via <http://eprints.undip.ac.id/3183/1/Presentation_MakalahQ_New.pdf> [accessed July 28, 2014]
- Waltham Forest Council. 2011. *Urban Design Framework: Creative Industry SME*. Available via <<http://www.walthamforest.gov.uk/Documents/bl-part11.pdf>> [accessed July 24, 2014]